A STUDY OF DEATHS DUE TO RAILWAY ACCIDENTS AUTOPSIED IN GOVERNMENT KILPAUK MEDICAL COLLEGE & HOSPITAL CHENNAI

Dissertation submitted to

THETAMILNADUDR.M.G.R.MEDICALUNIVERSITY

Inpartial fulfillment of the requirements for the award of degree of

M.D. (FORENSICMEDICINE)

(Branch-XIV)

DEPARTMENTOF FORENSIC MEDICINE

GOVT. KILPAUK MEDICAL COLLEGE CHENNAI -600010.

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CHENNAI – 600 032.

MAY - 2018

BONAFIDE CERTIFICATE

This is to certify that this dissertation titled **"A STUDY OF DEATHS DUE TO RAILWAY ACCIDENTS AUTOPSIED IN GOVERNMENT KILPAUK MEDICAL COLLEGE & HOSPITAL, CHENNAI"** bonafied original work done by **Dr. V. SURESH KUMAR,** Postgraduate in Department of Forensic Medicine Govt. Kilpauk Medical College, Chennai, in partial fulfillment of the regulations of The Tamil Nadu Dr. MGR University for the Award of M.D. Degree in Forensic Medicine (Branch XIV).

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DECLARATION

I, **Dr. V. SURESH KUMAR,** solemnly declare that the dissertation on **"A STUDY OF DEATHS DUE TO RAILWAY ACCIDENTS AUTOPSIED IN GOVERNMENT KILPAUK MEDICAL COLLEGE & HOSPITAL, CHENNAI"** is a bona- fide work done by me during the period of August 2015 to December 2016 at Government Kilpauk Medical College and Hospital, under the expert Supervision of **Dr. R. SELVAKUMAR, M.D,** Professor and Head of Department of Forensic Medicine, Government Kilpauk Medical College, Chennai. This thesis is submitted to The Tamil Nadu Dr .M.G.R. Medical University towards partial fulfillment of the rules and regulations for the M.D. degree examinations in Forensic Medicine to be held in April 2018.

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ACKNOWLEDGEMENT

I wish to thank **Dr. P. VASANTHAMANI. M.D., D.G.O., M.N.A.M.S., DCPSY., MBA.,** Dean, Govt. Kilpauk Medical College and Hospital, Chennai. With sincere gratitude and I wish to acknowledge the expert guidance and suggestions of **my Professor and HOD, Dr. R. SELVAKUMAR, MD.,** without whose permission and guidance this study would not have been possible.

I am deeply indebted and grateful to my co-guide **Dr. G. MANIGANDARAJ MD.,** Asst. Professor, Department of Forensic Medicine**,** Govt. Kilpauk Medical College and Hospital, Chennai for his valuable support and guidance.

I am deeply indebted to and highly grateful to my Assistant professors, **Dr. K.V. VINOTH, M.D., and Dr. S. KARTHIGA DEVI M.D**, Department of Forensic Medicine, Govt. Kilpauk Medical College, without whom this work would not be in the present shape.

I wish to thank **Dr. I. JITHENDER SINGH and Dr. S. DEVASENA,** Department of Forensic Medicine, Govt. Kilpauk Medical College, Chennai for their able guidance, constant inspiration and continuous encouragement rendered at every stage of this study. I wish to thank all my co-post graduates **Dr. S. SIVAKUMAR, Dr. D. KARTHIK, Dr. J.S. RAGHU DEEPAN, Dr. M. JEEVAGAN, Dr. M. SAMEER** for helping me in this work.

Finally, I must express my very profound gratitude to my parents, my beloved wife **Dr. S. PRABHAVATHI M.S,** & my lovable daughter **S. RAKSHITHA** for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis.

INSTITUTIONAL ETHICS COMMITTEE
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Protocol ID. No.06/2016 Meeting held on 14/12/2016

CERTIFICATE OF APPROVAL

The Institutional Ethical Committee of Govt. Kilpauk Medical College, Chennai reviewed and discussed the application for approval **"A STUDY OF DEATHS DUE TO RAILWAY ACCIDENTS AUTOPSIED IN GOVT.KILPAUK MEDICAL COLLEGE-CHENNAI"** submitted by Dr.V.Suresh Kumar., Post Graduate in Forensic Medicine, Govt. Kilpauk Medical College, Chennai.

The Proposal is APPROVED.

The Institutional Ethical Committee expects to be informed about the progress of the study any Adverse Drug Reaction Occurring in the Course of the study any change in the protocol and patient information /informed consent and asks to be provided a copy of the final report.

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ABBRIVATIONS

AM	-	Ante Merdiem
PM	-	Post Merdiem
PG	-	Post Graduate
HSC	-	Higher Secondary Class

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INTRODUCTION

Ever since the railway engine was invented, a railway disaster has been associated with numerous fatalities. Thousands of people have been killed over the years in railway incidents, as this constitutes a common mode of public transport system all over the world, especially in India, having a large railway network with unprotected railway crossings[1,2,3,4].

Indian Railway is a largest railway system in the world under a single management. Railway accidents occupied an important role in the medical and legal disclosures on trauma and traumatic disorders[5].

The Railways in India provide the principal mode of transportation for freight and passengers. It brings together people from the farthest corners of the country and makes the conduct of business, sightseeing, pilgrimage and educationpossible. The Indian Railways have been a great integrating force for more than 160 years. It has bound the economic life of the country and helped in accelerating the development of industry and agriculture. The Britishers had introduced this system with an idea to move their troops faster and transport goods, with a view to improve their trade and sustain their rule in India. Fortunately it proved out to be a great boon for India's all round development in post Independent era.

From a very modest beginning in 1853, when the first train steamed off from Mumbai to Thane in a distance of 34 km, Indian Railways have grown into a vast network of 6909 stations spread over a route length of 63327 km.

with a fleet of 8153 locomotives, 45350 passenger service vehicles, 5905 other coaching vehicles and 207719 wagons as on date. The growth of Indian Railways in the 150 years of its existence is thus phenomenal. It has played a vital role in the economic, industrial and social development of the country.

Presently it is said to be the 2nd largest railway network in the world, transporting seventeen million passengers and more than one million ton of freight daily. With so much of advantage from Railways the silent price our country is paying is the mortality rates we see due to Railway accidents. There are many Railway fatalities occuring in our Country every year leading to the death of thousands of people(6).

Bernard knight has classified the railway accidents into three groups:

1. *Train accidents:* Accidents to trains and rolling stock on or affecting passenger lines, and failures of rolling stock, track, and structures.

2. ***Movement accidents:*** Accidents to people caused by the movement of railway vehicles, excluding those due to train accidents.

3. *Non-movement accidents:* Accidents to people on railway premises, but not connected with the movement of Railway vehicles.

The second category of fatalities i.e. **due to movement accidents** had been taken up for this study and not the first category since the cumulative impact of accidents not considered as disasters far surpasses the impact of disasters which is evident from the above given statistics[7].

Railway fatalities taking toll of human lives and economy are often underreported and go unnoticed and the victims of these incidences are also ill compensated. It is therefore necessary to pay adequate attention to Railway fatalities and formulate appropriate policies for giving equal treatment to the victims of these events and also to make efforts for mitigating these.

People who are runover by a train or who wantedly put themselves under a moving train are the commonest Railway fatalities seen. However, there is also a possibility that some of the cases booked under Cr.P.C: 174 and brought for Post-mortem investigation could be of individuals who had been deliberately put on the tracks who were made unconscious or by overpowed to mimick an accident. Such cases pose the biggest challenge for a Forensic Expert. Another challenge faced by Forensic Medicine Experts is in the cases with a suspicion that the deceased had been killed at some other place and then put on or around Railway tracks, where it is difficult to differentiate homicides from suicides and accidents. Railway pattern of injuries should be differentiated from other injuries and also assess which of those injuries are either **antemortem/postmortem**[6]. These are some of the reasons for which the topic " **A Study of Deaths due to Railway Fatalities**" has been taken up.

HISTORY OF INDIAN RAILWAYS:

Indian railways is a State owned national transporter, responsible for rail transport in India. It is owned and operated by Government of India, through the Ministry of Railways. **It is the 2nd largest network in the world**, comprising 119,630 kilometres (74,330 mi) of total track[8]and 92,081 km (57,216 mi) of running track over a route of 66,687 km (41,437 mi) with 7,216 stations at the end of 2015-16[9]. In 2015-16, Indian Railways carried 8.107 billion passengers annually or more than 22 million passengers a day and 1.101 billion tons of freight annually[9].As of the end of 2015-16, of the total 68,525 km (42,579 mi) route length, 28,327 km (17,602 mi) or 45% were electrified and 28,371 km (17,629 mi) or 37% were double or multiple line routes[10]. **The railway network is predominantly a broad gauge network**. Small stretches of the network use metre and narrow gauges. All the electrified lines use 25 kV AC electric traction[9].

Indian Railways operates both long distance and suburban rail systems. **Indian Railways ran on average 13,313 passenger trains daily in 2015-16.**The trains have a five-digit numbering system. Mail or express trains, the most common types, run at an average speed of 50.9 km/hour(11). As of the end of 2015-16, Indian Railway's rolling stock comprised over 251,256 freight wagons, 70,241 passenger coaches and 11,122 locomotives powered by steam, 5,869 by diesel fuel and 5214 by electricity[9].

The first proposals for railways in India was made in Madras in 1832. [12]The first train in India ran **from Red Hills to Chintadripet bridge in Madras in**

1837. **It was called Red Hill Railway**. It was hauled by a rotary steam engine locomotive manufactured by **William Avery**. It was built by **Sir Arthur Cotton**. It was mainly used for transporting granite stones for road building work in Madras[12].

NOTABLE TRAINS OF INDIA

Figure 1:The Palace on Wheels is a specially designed train, frequently hauled by a steam locomotive, for promoting tourism in Rajasthan.

Figure 2:The Lifeline Express is a special train popularly known as the "Hospital-on heels" which provides healthcare to the rural areas. It has an operation theatre, patient wards and a store room.

Figure 3: Toy train in Ooty

Figure 4: The Bhopal Shatabdi Express is the fastest train in India today having a maximum speed of 140 km/h (87 mph) on the Faridabad-Agra section.

HIERARCHY OF TRAINS

Trains are classified by their average speed. A faster train has fewer stops ("halts") than a slower one and usually caters to long-distance travel.

Rank	Train	Description
1	Duronto Expresses	These are the non-stop point to point rail services (except for operational stops) introduced for the first time in 2009. These trains connects the metros and major state capitals of India and are faster than Rajdhani Expresses. The Duronto services consists of three classes of accommodation namely first AC, two-tier AC, three-tier AC.
2	Rajdhani Expresses	These are all air-conditioned trains linking major cities to New Delhi. The Rajdhanis have high priority and are one of the fastest trains in India, travelling at about 140 km/h (87 mph). There are only a few stops on a Rajdhani route.
3	Shatabdi and Jan Shatabdi Expresses	The Shatabdi trains are AC intercity seater-type trains. Jan-Shatabdi trains consists of both AC and non-AC classes.

4	Super-fast Expresses or Mail trains	These are trains that have an average speed greater than 55 km/h (34 mph). Tickets for these trains have an additional super-fast surcharge.
5	Express	These are the most common kind of trains in India. They have more stops than their super-fast counterparts, but they stop only at relatively important intermediate stations.
6	Passenger and Fast Passenger	These are slow trains that stop at most stations along the route and are the cheapest trains. The entire train consists of the General-type compartments.
7	Suburban trains	Trains that operate in urban areas, usually stop at all stations(13).

CAUSES OF RAILWAY ACCIDENTS:

There have been various causes for train accidents ranging from Human Failure to Equipment Failure to Sabotage etc. In the 7-years period between 2009 to 2016, human failure has caused more than 86% of the total accidents. Out of this, 41% accidents were caused due to the failure of railway staff and the rest due to the failure of others. **Equipment failure caused only 2.2% of the accidents.**[15]

As much as 40 % of Indian Railways' 1,219 line sections are utilised beyond 100 %, according to Indian Railways, the Lifeline of the nation. Technically, a section using more than 90 % of its capacity is considered saturated.The congestion rate is even higher.

It is 65% on 247 high density line sections of the Indian Railways network. "The optimal utilisation should be about 80 %," said ShriMukutMithi, Member of the Standing Committee on Railways and a RajyaSabha member[16].

Track failures and subsequent derailments are caused by twin factors– excessive traffic and underinvestment in rail infrastructure– an Indian Spent analysis of available data shows. Consider this: There has been a 56 % increase in the daily tally of passenger trains over 15 years–from 8,520 in 2000-01 to 13,313 in 2015-16. The number of freight trains increased by 59 % in the same period. But the running track length for all these trains increased by

only 12% in 15 years–from 81,865 kilometres to 92,081 kilometres. Slow track expansion and renewal and coach upgrades[16].

A total of 27,581 Indians died in 2014 in railway related accidents, the latest data by the National Crime Records Bureau showsrailway-related accidents in two categories - railway and railways crossing accidents.

The leading cause of deaths in railway accidents was fall from trains/collision of trains with people on tracks, which together accounted for 13,542 deaths. Other causes include - collisions (99 deaths), derailments (59 deaths), and explosion/fire (12 deaths)[17]. Causes for rest of the cases are not known.

A total of 99 consequential train accidents took place during April 1, 2016 to February 28, 2017, out of which 64 were due to failure of railway staff. Out of the 99 train accidents, 19 were caused due to the failure of factors other than the railway staff, Minister of State for Railways[18].

Railway accidents

According to the National Crime Records Bureau, 25,006 people died and 3,882 were injured in a total of 28,360 railway accidents across the country in 2014. The railway accident cases have decreased by 9.2% as compared to those in 2013.

Maharashtra reported the maximum or 7,969 such cases in which 5,024 people were killed and 3,208 were injured. In cities, the maximum number of

deaths was reported in Delhi (856 deaths), followed by Bhopal (132 deaths), Allahabad (92 deaths) and Jabalpur (76 deaths).

The maximum number of railway accidents happened in June or 9.4% of the total. And most of these accidents or 17.5% of total were reported between 6.00am and 9.00am.

Railway crossing accidents

National Crime Records Bureau says a total of 2,547 railway crossing accidents led to 2,575 deaths and 126 injuries across the country in 2014. The railways crossing accidents have increased by 83.5% when compared to 2013.

In India most of the railway tracks run to populated areas and being the cheapest mode of transportation, most trains travel thickly packed. All these factors increase the possibilities of accidents[(19)].

Railway deaths are usually because of a person trying to cross the track/collision between trains, automobile accident in unmanned crossings, passengers who hang out of doors & are hit by trees/poles or during outbreak of fire [(20)].

Figure 5 : Photograph showing overcrowded train

Figure 6: photograph showing people walking in tracks.

AIM OF THE STUDY

- To study the pattern of injuries in these cases and to arrive to a reasonable conclusion on their contribution to the deaths.
- To analyze the possibility of differentiating the manner of death specifically bound to the pattern and type of injuries.
- To suggest preventive measure that can be adopted to prevent railway accidents.

REVIEW OF LITERATURE

Railway Fatalities might create complex problems of vital importance to the bereaved families, for insurance compensation claims, legal and law enforcement authorities, railway authorities, and the public at large.

The main crux of medico-legal problems is the establishment of the identity of the deceased. Most of the cases reported are unknown in a badly mauled, mutilated, condition where the definite identification from external features is not possible, but all efforts should be made to identify the victim from the clothes and other personal effects. **A proper coordination between the Medical Officer and Investigating Officer supplemented by good photography at the scene and during autopsy might prove to be of immense help in establishing identity and more particularly in arriving at a conclusion regarding the manner of death.** The important points which have lead to immediate or proximate cause of death should be looked upon. The cause of death which was responsible for initiating the chain of physiological disturbances, brief or prolonged which produced the fatal termination. But when trauma kills so quickly as in a railway fatality, there was no opportunity for sequel or complications to develop. Hence the injuries are both the immediate or proximate causes of death.

Legally, the effective cause of death including the probable manner of death is the most important points to be dealt by the Medico-Legal expert. Complete anatomical examination together with other required lab studies

which stem from it, are the time honored methods aiding in determining the Cause of Death. Functioning as a morbid anatomist the Medical Officer seeks for organic abnormalities - Traumatic or Natural or both whose presence is incompatible for survival.

Establishing the cause of death is an interpretative step, an intellectual process, derived by depending upon the sound evaluation of morphological evidence of injury or disease and the results of toxicological, bio-chemical and histopathological studies.

The second step essential for establishing the cause of death requires an understanding and exposition of the mechanism by which other deviations from the normal actually caused the death. The Medical Officers observations are never sufficient to establish the manner of death in many cases, where the investigation outside the autopsy room and far from the microscope, by the Police and others, is often essential. The medical emphasis of railway casualty is more complex implicating multiple effective factors and mechanisms, more rapid and strict requirement of undisputable proof and aiming towards understanding the culmination of death by reconstruction of the scene of offence. The legal emphasis is equally important as practical focusing on the probable and legal effective cause towards the determination or ultimate responsibilities.

The proper certification of death in general and railway fatalities in particular not only related to the competence of autopsy surgeon but also his

knowledge and understanding of the related medico-legal issues. **The following observations are to be taken into consideration in the determination of medico-legal cause of death.**

1. **Postmortem findings.**
2. **Immediate circumstances leading to death.**
3. **Explicit or implicit mental intent of the victim and**
4. **Psychological profile and pattern of the victim or causality.**

The implicit mental intent of the victim and his psychological profile and pattern may be important in understanding the genesis of the fatality and their legal values. The major determinants of medico-legal cause of death are autopsy findings and actual reconstruction of the accident. Presence of severe injuries may affirm traumatic nature of cause of death for example crush injuries of head, traumatic decapitations, crush injuries of trunk and traumatic amputations of limbs. The pattern of injuries and circumstances indicate the manner of traumatic nature of death.

The object of railway fatalities enquiry is to determine the cause of death and it is in no way a court for the determination of legal responsibility. Thus the whole procedure of the enquiry differs from the sort of enquiry that may be conducted in other types of accidents.

In many of the railway fatalities usually there are no interested parties to know, what has lead to death except to find out the cause of death. Even the

investigating officer will weigh up the evidence in their own way, reaching own conclusions and opinion regarding the nature of the incident.

Faulty determination of railway fatalities may result from defective reconstruction of accident, incomplete autopsy, misinterpretation of injury patterns, lack of or incomplete microscopic and toxicological examination.

In most cases, whenever a dead body is found along railway track, it can be presumed as an accidental or suicidal death by the public. Same is the case when a dead body is found in a railway compartment which can be presumed as a natural death. In all these cases the investigating officer is more worried about shifting the dead body to the nearest mortuary and completion of the formalities rather than the meticulous examination of the scene of crime. Habitually, examination of scene of crime is confined to taking one or two photographs, which is not adequate. This is how in the first step itself a lot of vital clues are lost.

The same is the case with medical officer whenever he receives a railway fatality for autopsy. The autopsy itself is conducted with a preformed idea of suicide or accident taking into consideration the pattern of the injuries over the body. Decapitation or traumatic amputations are considered as suicidal deaths where as the cases of multiple trauma are considered as accidental.

The Medical Officer devotes less concentration without going into history compared to other cases, since most of these cases are reported as unknown bodies. In this way incomplete autopsy and improper study of injury

patterns formed a common source of pitfall in medico-legal evaluation. The injury should be examined in more detail to find out the nature whether ante mortem or post mortem from infiltration of hemorrhage into the tissues or vital organs.

In doubtful cases an extensive histo-pathological examination is made to clinch the issue. The determination and evaluation of casualities in railway fatalities may be of complex nature, but proper scrutiny of the medico-legal casualty often proves to be the subject of medico-legal interest to many individuals and social groups.

The rail road represented one of the major technological achievements of the 19th century. Efficient and safe transport infrastructure is vital for economic growth in developing countries, sadly rail road collusions which resulted in major injuries and loss of life, begin to tarnish the image of popular mode of transport systems[(4)].

LERER L.B et al studied the railway related deaths, the cape town of South Africa between 1992 to 1994. Of the 379 railway related deaths, 27 were among pedestrians or commuters who were hit by a train while crossing the track, 38 were among commuters who fell from moving trains, 32 were suicides, 43 were the result of criminal violence on trains or at railway stations, and 38 were due to other causes.

Most railway fatalities were among men between the ages of 25 to 44 years. About half of all railway fatalities occurred at peak commuting times.

With high levels of violence (often robbery related) recorded during the evening time. A blood alcohol concentration >0.1gms/100ml was found in 35% of the people who died from crossing the track or falling from moving trains. Fatal railway injury is characterized by extensive disruption of more than one body region[21].

SCHIMIDTKE.A et al.- studied the suicidal behaviour on railways in FEDERAL REPUBLIC OF GERMANY. There were 6090 suicides and 391 attempted suicides on railways in the Federal Republic of Germany. This suicide method was compared to other methods with respect to seasonal and daily distributions and fluctuations by time of day for age and sex. The ratio of males to females was 2.54:1 and the relative incidence of this type of suicide as compared to the total number of suicides was high among the younger age groups. Investigation of seasonal variation revealed a peak for males in the autumn. There was a marked higher incidence of railway suicides committed by males on Mondays and Tuesdays. This peak was less pronounced for females. Most incidents occurred in the evening hours (especially after sunset). An investigation of the relationship between the severity of injuries and the location of the suicide attempt revealed that those who attempted suicide on railway tracks in the countryside were more seriously injured than those who attempted took place in or near main stations[22].

Suicidal decapitation is a very rare method of self-destruction.[23]. Sometimes a person is killed and body is placed on the railway track to simulate accident or suicide. Examination of the scene of crime and the body

for marks of violence will often solve the problem[53]. In most of victims of railway accidents injuries over the head were fatal in nature[24].

Suicide deaths due to train run over are common in males as they prefer hard methods of committing suicide than females & extensive injuries are due to primary impact. When the person lies down on the railway tracks there may be decapitation, amputation of limbs & dismembering of the body [25].

CLARKE RV – et al studied the suicidal deaths on the London metro and suggested preventive methods like…

1. Reducing public access to the tracks.
2. Improving surveillance by station staff.
3. Facilitating emergency stops and reducing injury[26].

SINGER-G et al University of Southern California studied train verses pedestrian injuries for a period of 1989-1993, studied 30 train's verses pedestrian's injuries. Although some patients suffered head chest and abdominal injuries, the majority of injuries sustained were musculoskeletal. The injury severity score ranged from 5 to 54, with an average of 21 of the 30 patients, 23 (77%) had significant orthopedic injured, with an average of 1.7 extremities involved. The foot was the most commonly injured body segment, sustaining amputation, crush or degloving injury in 12 patients (52%). The most common operative procedure was debridement, which was performed largely on patients with traumatic amputation I effort to preserve length.

(19)inlower extremity and(2)in upper extremity. Amputations were necessary in (14) patients. With exception of tow and heel avulsion, nearly all crush and avulsion injuries required amputations at a segment higher than the level of injury. Although image of an unstable patient with mangled extremities, many patients survive low velocity collisions and subsequently require vigorous orthopedic intervention[27].

BERNARD KNIGHT – studied railway fatalities especially in countries with many level crossings (Called **'grade crossings'** in the USA) where a public road crosses a railway track with either no barrier at all or with only a flimsy lifting pole. Many vehicles are stuck each year by passing locomotives.

Rail passengers are killed or injured in moving trains compared with accidents to railway staff and to other types of accident on railway property.

Track workers may be run down and some die from electrocution from overhead cables. The pathology of is no different from accidents elsewhere, the interest lying in the occupational epidemiology and preventive aspects.

One worrying development in recent years is the malicious damage caused to trains, either by placing objects on the tracks, which may cause a derailment or the dropping of objects from bridges.

The author has conducted an autopsy on a driver killed by a concrete block dropped from a bridge, which smashed through the windshield of his cab.

The other fairly common railway fatality is that of a suicidee who lays himself in front of an approaching train. Decapitation is the most common injury and the obvious features are the local tissue destruction, usually with grease, rust or other dirt soiling of the damaged area.

The usual search for alcohol and other drugs must be made, as persons committing suicides often employ multiple methods to ensure self-destruction. As well as lying down before a locomotive, another common method of suicide in large cities is to jump from the subway platform of an underground **'tube' or'metro' system**. Here injuries are sometimes complicated by high voltage electrocution, as the typical traction voltage of an electric railway is in excess of 600 volts[7].

SCHMIDTKE, 1994: The distribution by day of the week shows an even pattern with a slightly elevated mean frequency of suicides on weekdays. Similar patterns are shown in other European studies Most of the suicides occur during the daytime (6.00 a.m. to 6.00 p.m.), which could be explained by the higher density of trains in traffic[22].

SAHOO PC, KAR SM ET AL in their study called pattern of injuries in railway deaths, 1990-91. 70 cases were studied for nature of injuries, nature of death distribution of injuries according to age and sex[28].

SHEIKH M. I.et al concluded through their study on deaths due to Railway accidents that Cause of death in majority of the cases was shock as a

result of hemorrhage either due to multiple injuries or head injury. Various aspects have been discussed in this paper[5].

****MOHANTY MK et al** carried out a study on 88 railway related deaths in order to determine the specific pattern and distribution of wounds. Of the (88) victims, (79.5%) were males and (20.5%) were females. The majority were in the age group of (21-40 years). Most of the victims died as the result of an accident (80.7%). Of the 17 suicide cases, ten deaths occurred during the night. In 71 railway accident deaths, (64.8%) of victims were pedestrians; thirty-five victims were illiterate and two had consumed alcohol. Decapitation wounds were more common in suicidal deaths and the head was the body region most commonly involved in railway accidents. Our results indicate that railway related deaths could be prevented by surveillance, education and public awareness.[29]

BADIADKA KISHORE KUMAR in their study to find out the epidemiological features in traumatic deaths on the railway tracks, so as to identify the risk groups and to suggest prevention measures. Selections of cases were from the reported cases for autopsy.

79 cases of Traumatic deaths due to train-person collisions and fall from the trains were analyzed. (86%) were Males. (74.6%) of the victims were between 21 and 50 years of age.

Unique features of lost identity (22%), absence of survival time (92.4%) and undetermined manner of the death (24%) are the hallmark of such

traumatic deaths on the railway tracks. (42%) died due to suicide and (34%)died due to accident. All the suicidal victims died due to train-person collision. (94%)of the accidental victims were pedestrians. Most of the deaths occurred during commuting hours. About one-third of the suicidal events occurred on Sundays. While mental illness and unemployment were associated with suicidal deaths, alcoholic intoxication was found associated with accidental deaths. Our study found that traumatic events due to train-person collisions or fall from trains could be prevented.[30].

BERNARD KNIGHT:

Movement accidents:-

Movement accidents are more common than train accidents in our country and in our state. The commonest cause among the passengers was falling from the running trains or while entering or alighting from moving trains and falling off a platform and run over by trains while crossing the railway line. The majority of movement accidents are seen due to run over accidents by moving trains. Level crossings also contribute to various accidents resulting in loss of life and injuries to the pedestrians. Trespassers into the railway tracks are also commonly involved in accidents and often they are killed or injured.

Railway injuries:-

Railway injuries are mostly accidental or homicidal in nature, the homicidal deaths from railway injuries is a rare occurrence, **a simple**

decapitation injury is usually considered as a hallmark of suicide. Traumatic amputation of limbs or transection of trunk is commonly seen in accidental cases, rarely when a person falls in front of the running train. The nature of injury on the body is mostly dependent on the position of the person when struck by a train on a railway line.

Suicidal injuries:-

A person intended to commit suicide by a railway run over usually lies in between the tracks, either in supine or prone position by keeping his head on either one of the rails. In these cases the primary impact injuries are in the form of a simple traumatic decapitation with completely detached or amputated head outside the rail, and the torso in between the rails. The torso will not show any injuries except the oil stains unless it is struck or dragged by the projecting parts of the rolling stock. In these cases the head and torso are seen at a distance with spilling of bloodstains. In some cases the continuity of the head is maintained with the torso with avulsion of the skin of the neck with the crushing of the underlying neck structures and cervical vertebrae. This type of simple decapitation is commonly an indication of suicide and rarely accidental in nature. In many cases a suicide was also attempted by placing the torso across the line, resulting in transection of the trunk with or without amputation of the upper limbs.

If the suicidee runs or jumps in front of a running train the primary impact injury are seen at the sight of contact in the form of blunt force injuries which depends on the position of the body at the time of contact, if the contact

is from the sides the primary impact injuries are seen on the side of the trunk involving head and shoulders also, the secondary injuries are seen sustained due to fall, dragging or rolling by the rolling stock. **Altogether this causes a greater mutilation of the body mimicking an accidental injury**. In these cases the exact nature of the death cannot be ascertained, unless there is evidence from the driver of the loco or passersby.

With regard to suicides by jumping from a running train the body is usually found at some distance, due to acceleration impact on the body by the running train and also due to sloppy nature of the railway track on either side, which results in rolling of the body. In these cases the crush injuries are rare unless the body is struck against an electric pole or signal pole. The injuries are mostly surface injuries with fatal cranio-cerebral trauma. In these cases ascertaining the exact nature of the death will become difficult unless there is corroborative evidence.

Accidental injuries:

The accidental injuries are commonly sustained while walking along the track or crossing the track. Apart from it accidental injuries are also common while alighting or getting down from a running train, a fall from a running train or during shunting operations.

While walking on the railway lines the injuries which are received by the individuals are impact injuries, caused by the forcible contact with various parts of the railway engine by protruding objects on the either side of the

railway line, secondary injuries result from forcible fall or by running over due to being thrown away in the accidents. **The surface injuries are mostly grazed abrasions, contusions and lacerations and access underneath the soft tissue injuries**. The injuries may be found soiled by engine oil, dust, dirt and dust from the railway track and rolling stock. In accidental falls from running trains the injuries are mostly surface trauma with graze abrasions taking the pride. Leaning from the doors, window of running trains, the head is in accessible position to receive trauma, from the side poles. **It is also a common sight in our country, to see ticketless and unauthorized travelling by commuters on the roof of the running trains. An accidental slip from the roof top may result in injuries which are identical with the trauma of fall from height, but the severity is more in these cases due to linear acceleration imparted to the bodies from the running train apart from the height factor.**

The recent trend of electrification became an added hazard particularly for the commuters travelling on roof tops, in the form of high voltage electrical injuries with added mechanical trauma.

In collusions with two moving trains or a moving train against a stationary train, the victims usually presents with typical fractures of legs similar to those found in automobile accidents, and also fractures of the skull and spinal column, from compression transmitted forces, traumatic asphyxia and other injuries produced by entangled metal frames of the railway compartments.

The accidental railway injuries have also become an occupational hazard for the personnel working in the maintenance of the rolling stock and railway track. During alighting or getting down from a running train, particularly when a train enters or leaves the railway station, and accidental slip between the platform and running train result in crush injuries of the lower part of the body. The injury sustained during shunting operations is almost crush injuries mostly confined to trunk caused by buffers.

Traumatic asphyxia may result from crushing between the buffers of the train in shunting accidents. The autopsy may reveal crushing injuries with abrasions, contusions, lacerations etc., fracture of ribs, sternum, fracture dislocation of spinal column and rupture of internal organs i.e., liver, spleen, diaphragm, heart, lungs, kidneys and intestines and also other viscera.

The railway workers entangled in track maintenance are increasingly becoming victims of accidental railway injuries. They may reveal primary impact injury over their back and buttocks and secondary injuries commonly over from side of the body from impact with rough uneven surface on the railway line, when thrown off, traumatic amputation of limbs or bisection of the trunk may take place when these workers fall under a running train, they sustain run over pattern of train injuries.

In derailment railway accidents commonly the transmitted force may cause compression fractures of spine, fracture dislocation of cervical vertebrae from forward or backward sudden jerks over the neck and also head injuries.

Adult victims presenting apparently with accidental nature of run over railway injuries may be suicidal in nature. Often it is impossible to distinguish an accidental death from that of suicide.

Homicidal injuries:-

In our country it is becoming an increasing practice to kill a person by other modalities and keeping the dead body on a railway track or besides railway track to mimic it as a case of suicidal or accidental railway injury. Certain factors in the investigation of train accidents and subsequent autopsy examination may give rise to some definite conclusions in forming opinions. The various factors such as examination of scene of death/crime, nature of various injuries, postmortem staining on dependent parts and presence of rigor mortis gives helpful information in coming to the conclusions.

The examination of scene of death/crime may reveal extensive areas of blood staining over a large area indicating that the person was alive at the time of involvement of the accident.

Cases of homicidal deaths simulating railway accidents reveal presence of finger, nail marks and finger tip bruises in cases of throttling. In cases of stab injuries definite types of injuries are commonly seen on Post-Mortem Examination. The presence of these marks of violence often solves the problem.

The postmortem staining over the dependent parts of the dead body may provide valuable clues about time since and position of the body which may

lead towards some other cause of death rather than Railway fatalities. The finding of rigor mortis i.e presence or absence, may also offer additional information in arriving at the time since death. An unconscious person or an incapacitated individual may be left on a railway track to be run over by a train to simulate it as a case of suicide or accidental death. The cause and the nature of death may become difficult often due to advanced decomposition as well as gross mutilation. Very rarely a passenger may be pushed out of the running train with an idea of killing him, where it is seen that certain injuries indicate forcible fall from the running train which should be corroborated with circumstantial evidence and the investigation.[7]

The primary impact injuries are related to the head and arms, chest, trunk as it is usually get struck from the side, which are usually multiple and extensive and the secondary injuries are due to been thrown down and run over resulting in the crushing and deep injuries.[31]

The injuries associated with the squeezing between rolling stock are often those of a ‘flail chest’, with or without evidence of **‘traumatic asphyxia’**.[32].

MATERIALS AND METHODS

Study group	All cases of railway accidents brought for Autopsyin Kilpauk Medical College & Hospital
Study design	Descriptive study
Place of study	Government Kilpauk Medical College & Hospital, Chennai-10.
Duration of study	17 months (August 2015 – December 2016)
Conflict of interest	Nil
Hazards of study	Nil
Data collection	The data of each deceased will be collected on a proforma specially designed for this study and which includes History given by police, Previous medical records if so, autopsy findings and forensic science lab evidence which will be analyzed for significance correlation.

INCLUSION CRITERIA :

All cases of Deaths Due to railway accidents submitted for autopsy in GovernmentKilpauk Medical College & Hospital, Chennai- 10.

EXCLUSION CRITERIA :

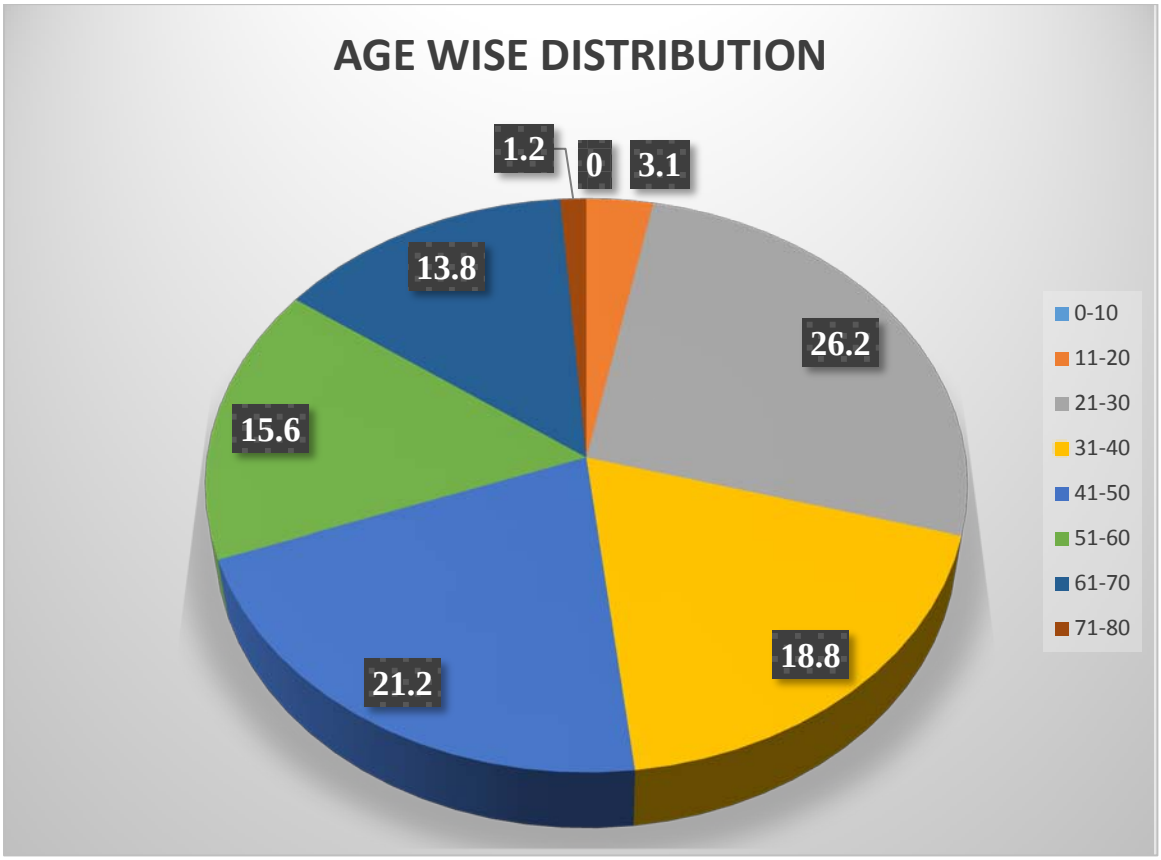
Deaths due to other cases except Railway accident cases autopsied at Government Kilpauk Medical College & Hospital, Chennai -10.

OBSERVATION & RESULTS

TABLE 1:AGE WISE DISTRIBUTION

Age in years	No of deaths	Percentage (%)
0-10	0	0
11-20	5	3.1
21-30	**42**	**26.2**
31-40	30	18.8
41-50	34	21.2
51-60	25	15.6
61-70	22	13.8
71-80	2	1.2
Total	160	100

FIGURE 7: AGE WISE DISTRIBUTION

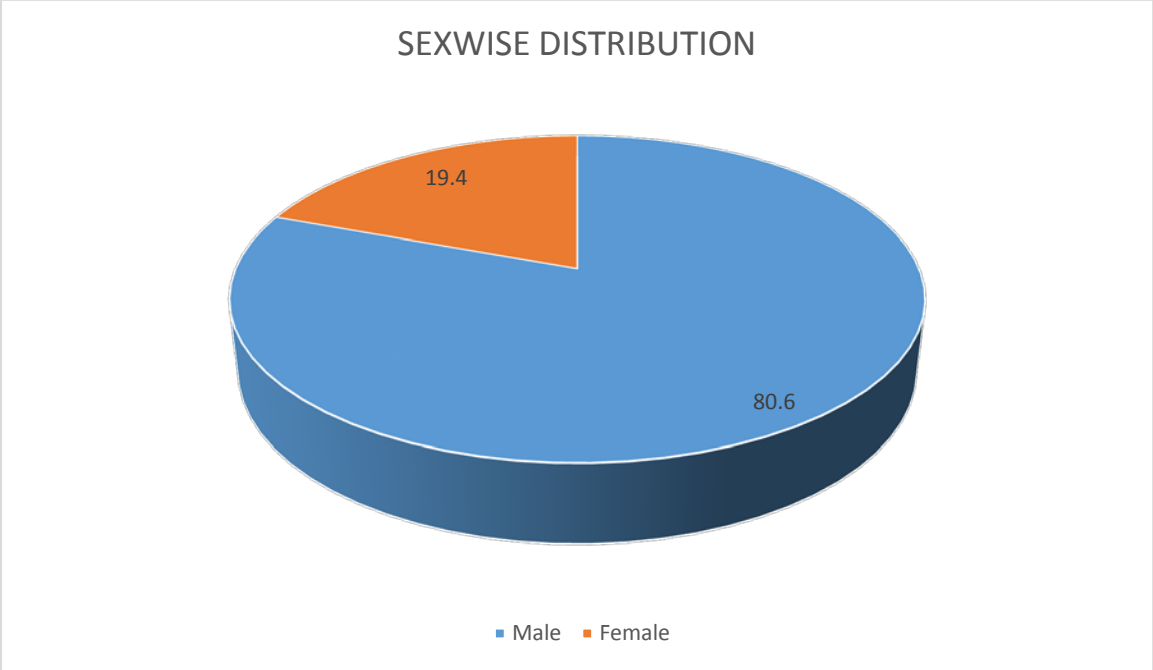


The maximum number of railway fatalities were in the third decade of life, followed by fifth and then the fourth decades. About 26.2% of the deceased people were in their third decade of life, 21.2% in their fifth decade and 18.8% in their fourth decade as shown in the above table. The age group with least percentage of deaths was in the eighth decade with 1.2% of the total cases. The incidence of railway fatalities was rare at extremes of age i.e., below 10 years and above 70 years.

TABLE 2: SEX WISE DISTRIBUTION

Sex	Number of patients	Percentage (%)
Male	**129**	**80.6**
Female	31	19.4
Total	160	100

FIGURE 8: SEX WISE DISTRIBUTION

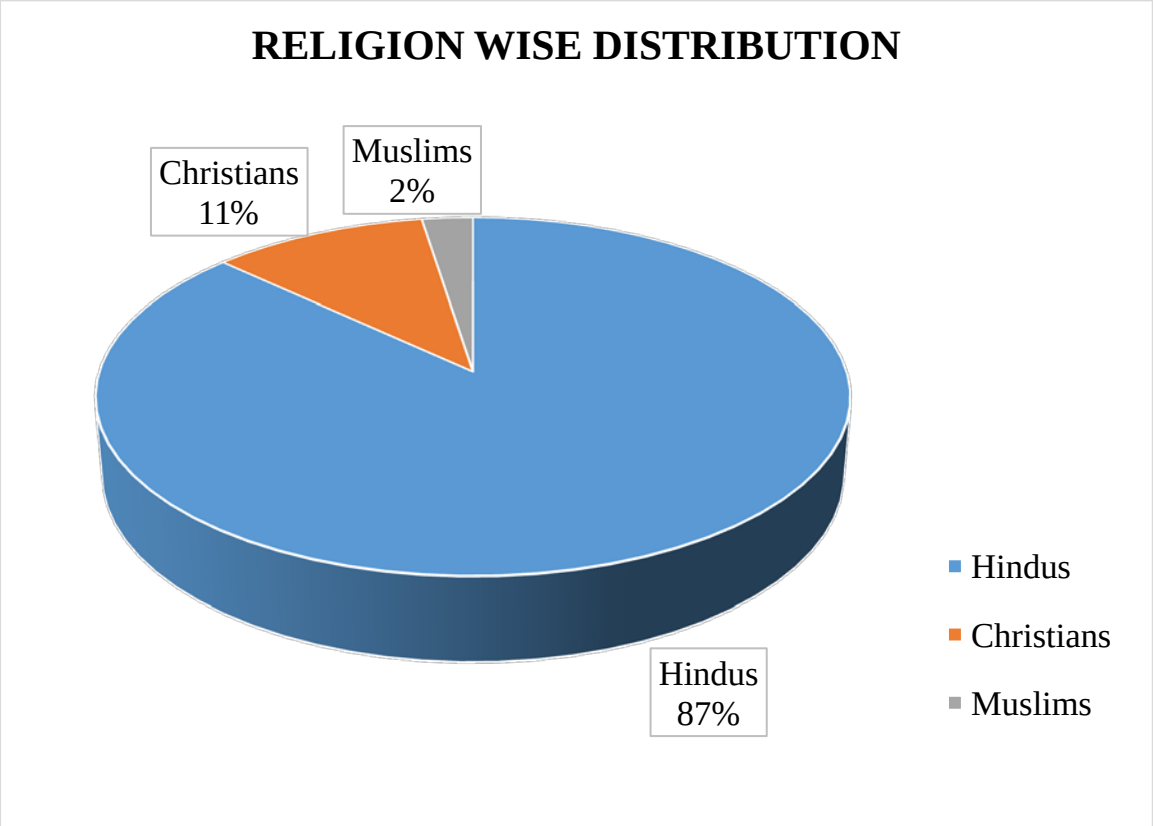


From the above table it is evident that males outnumbered females in the ratio of 4:1. This clearly reflects the vulnerability of males to railway fatalities.

TABLE 3: RELIGION WISE DISTRIBUTION

Religion	Number of patients	Percentage (%)
Hindus	**139**	**86.9**
Christians	17	10.6
Muslims	4	2.5
Total	160	100

FIGURE 9: RELIGION WISE DISTRIBUTION

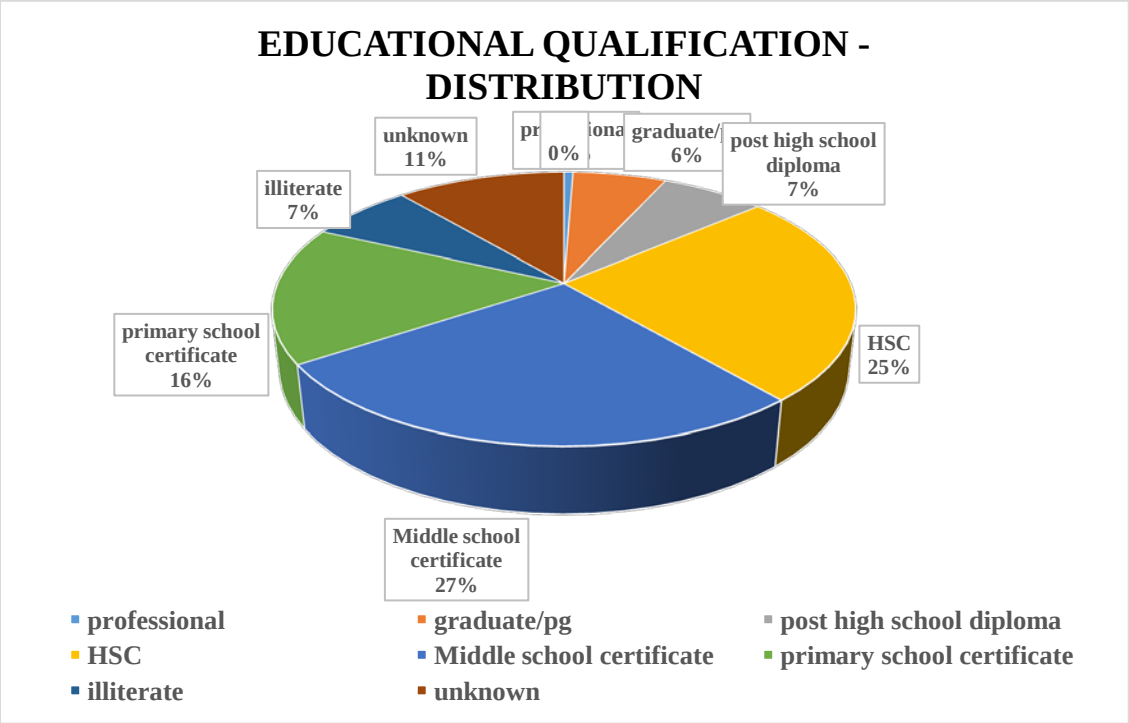


Majority of cases of railway fatalities were hindu's which is evident from the above table.

TABLE 4: EDUCATIONAL QUALIFICATION

Education	Number of patients	Percentage (%)
Professional	1	0.6
Graduate / Post Graduate	10	6.2
Post high school diploma	11	6.9
Higher Secondary School	40	25
Middle school certificate	**43**	**26.9**
Primary school certificate	26	16.2
Illiterate	11	6.9
Unknown	18	11.2
Total	160	100

FIGURE 10: EDUCATIONAL QUALIFICATION

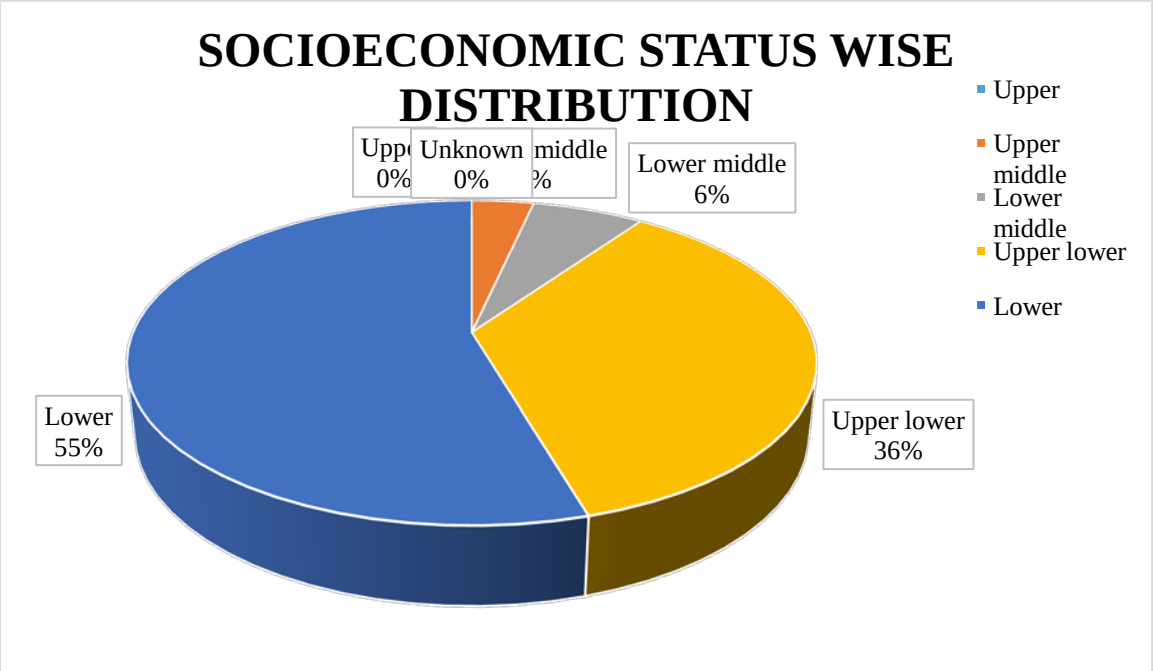


On analysing the educational qualification of cases of railway fatalities, majority were middle school level which contributed to 26.9% of the total percentage, followed by cases with primary school level with a percentage of 16.2% of the total. 6.9% cases were illiterate.

TABLE5 : SOCIO ECONOMIC STATUS

Socioeconomic status	Number of patients	Percentage (%)
Upper	0	0
Upper middle	5	3.1
Lower middle	9	5.6
Upper lower	51	31.9
Lower	**78**	**48.75**
Unknown	17	10.6
Total	160	100

FIGURE 11: SOCIO ECONOMIC STATUS

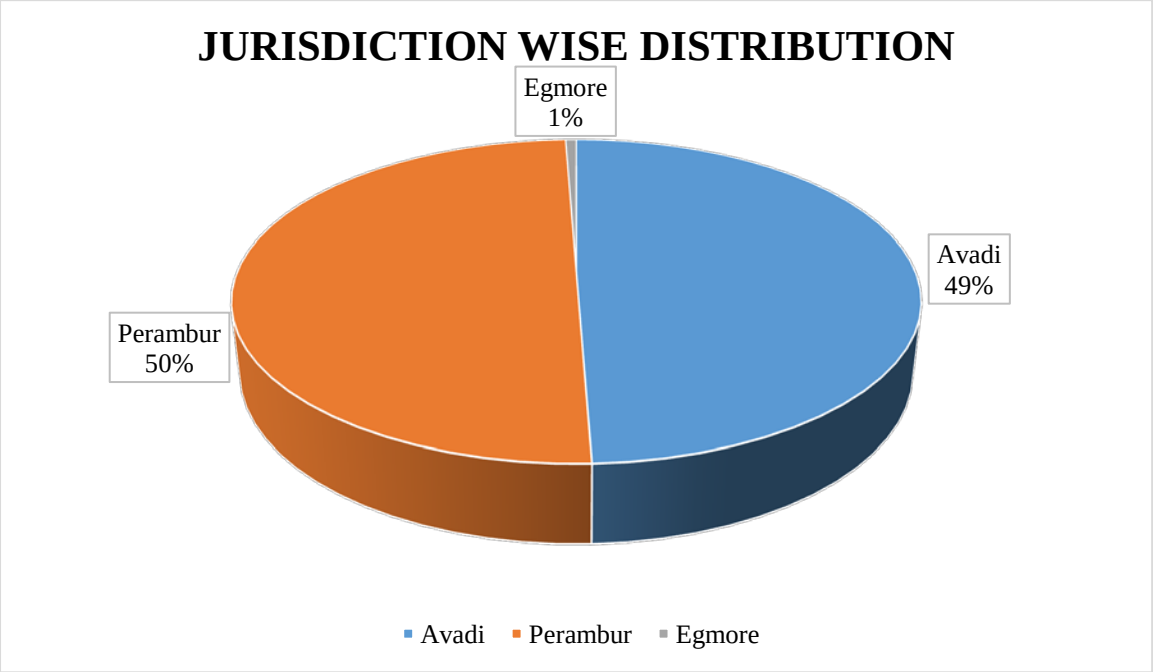


In this study, 48.75% of cases were from the low socio economic status which contributed to the majority of cases, followed by upper lower class which contributed to 31.9% of the total number of cases. There were no cases from the upper socio economic class.

TABLE 6: JURISDICTION WISE DISTRIBUTION

Jurisdiction	Number of patients	Percentage (%)
Avadi	79	49.4
Perambur	**80**	**50**
Egmore	1	0.6
Total	160	100

FIGURE 12: JURISDICTION WISE DISTRIBUTION

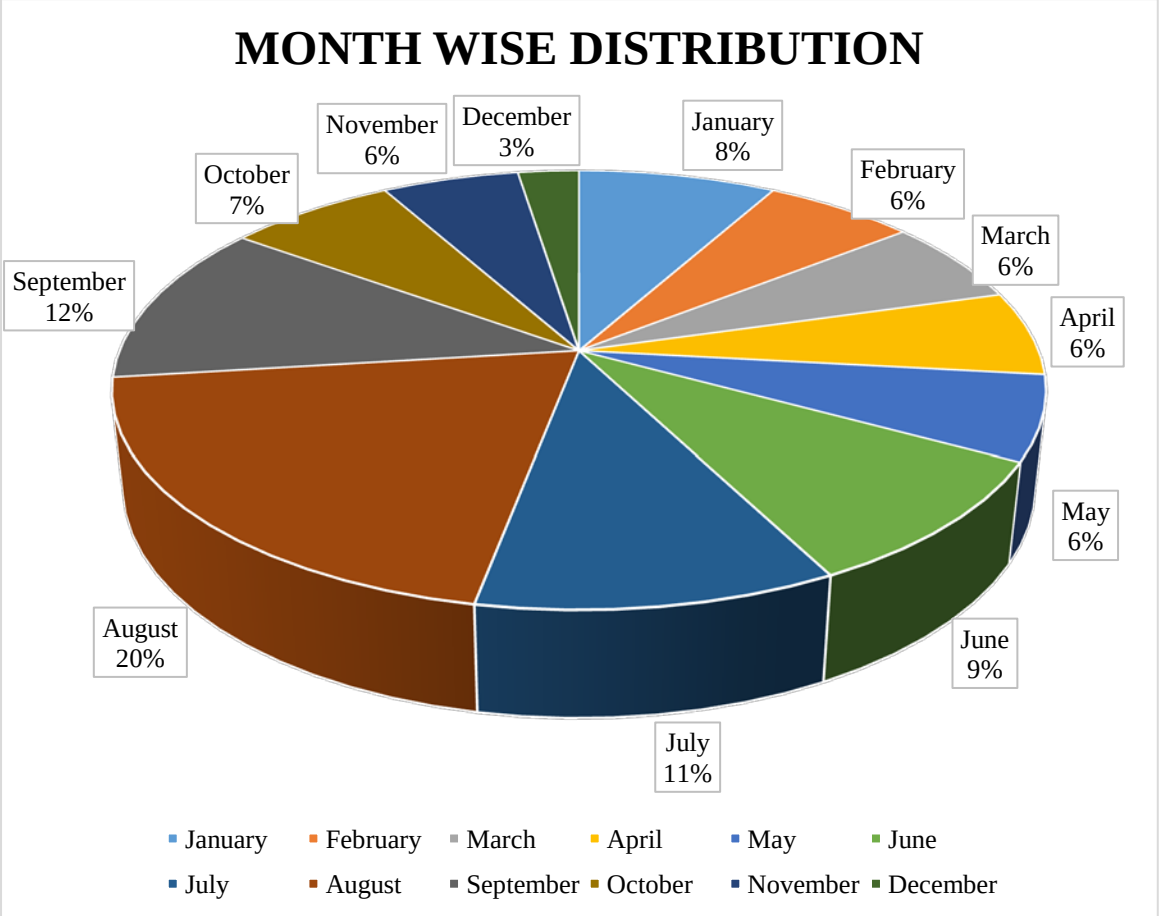


On analysing the jurisdiction wise distribution, majority of the cases were from Perambur jurisdiction (50%). Very closely this is followed by Avadi jurisdiction with 49.4% of the cases. Egmore had least number of cases i.e., 0.6% of total cases.

TABLE7 : MONTH WISE DISTRIBUTION

Month	Number of patients	Percentage (%)
January	13	8.1
February	10	6.2
March	10	6.2
April	10	6.2
May	10	6.2
June	15	9.4
July	17	10.6
August	**32**	**20**
September	19	11.9
October	11	6.9
November	9	5.6
December	4	2.5
Total	160	100

FIGURE 13: MONTH WISE DISTRIBUTION

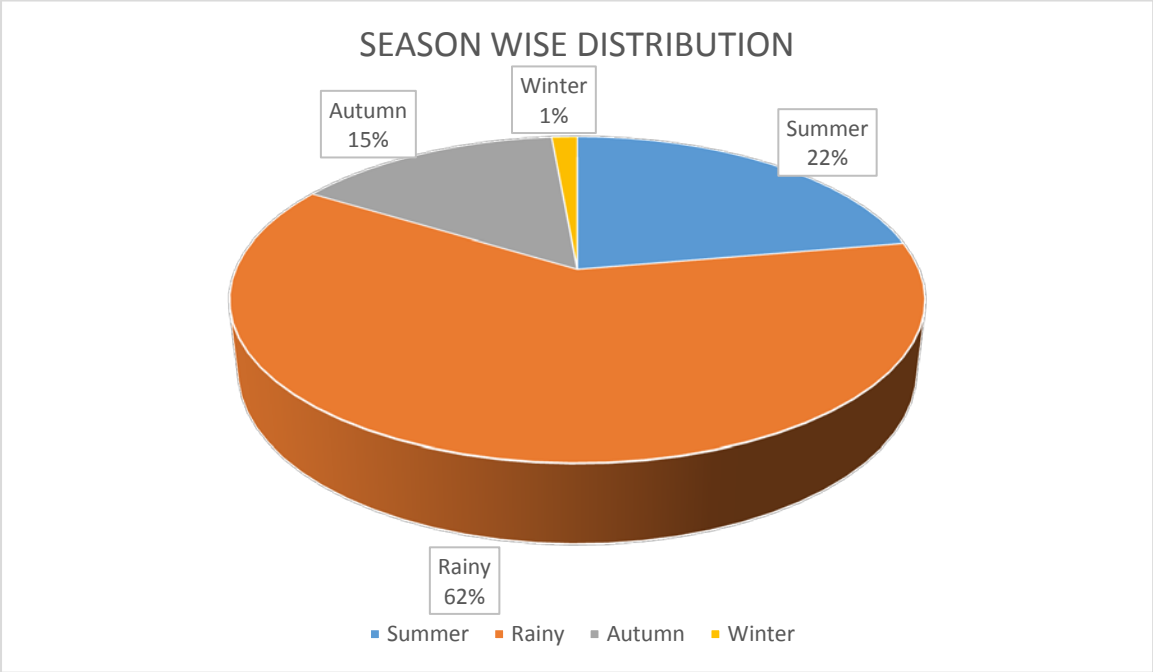


From the above table it is evident that, the death from railway accidents were seen throughout the year. The maximum number of cases were seen in the month of August, which contributed to 20% of the cases. The least number of cases were found in February, March, April,May with each contributing to 6.2% of total number of cases.

TABLE8 : SEASON WISE DISTRIBUTION

Season	Number of patients	Percentage (%)
Summer	30	18.8
Rainy	**83**	**51.9**
Autumn	20	12.5
Winter	27	16.9
Total	160	100

FIGURE 14: SEASON WISE DISTRIBUTION

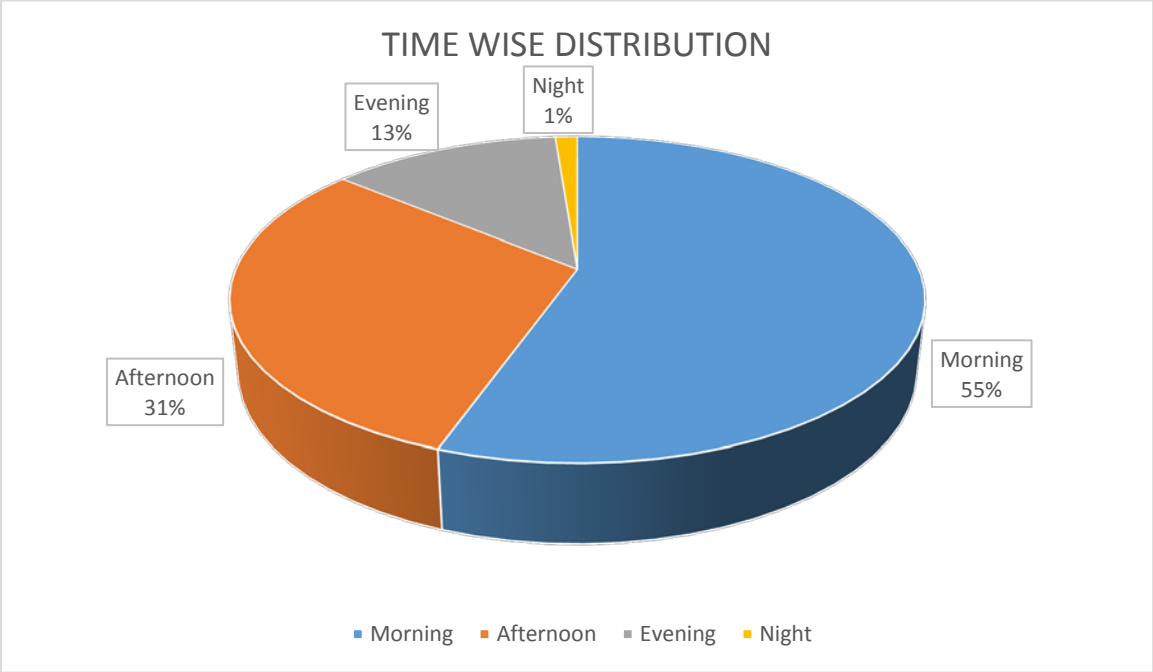


In our study, maximum number of railway fatalities occurred during the rainy season, which was 62% of the total number of cases. The least number of cases were during the winter season which contributed to 1% of the total.

TABLE 9 : TIME OF ACCIDENT

Time of accident	Number of patients	Percentage (%)
Morning (5am-12pm)	**87**	**54.4**
Afternoon (12pm-5pm)	48	30
Evening (5pm-10pm)	20	12.5
Night (10pm-5am)	5	3.1
Total	160	100

FIGURE15 : TIME OF ACCIDENT

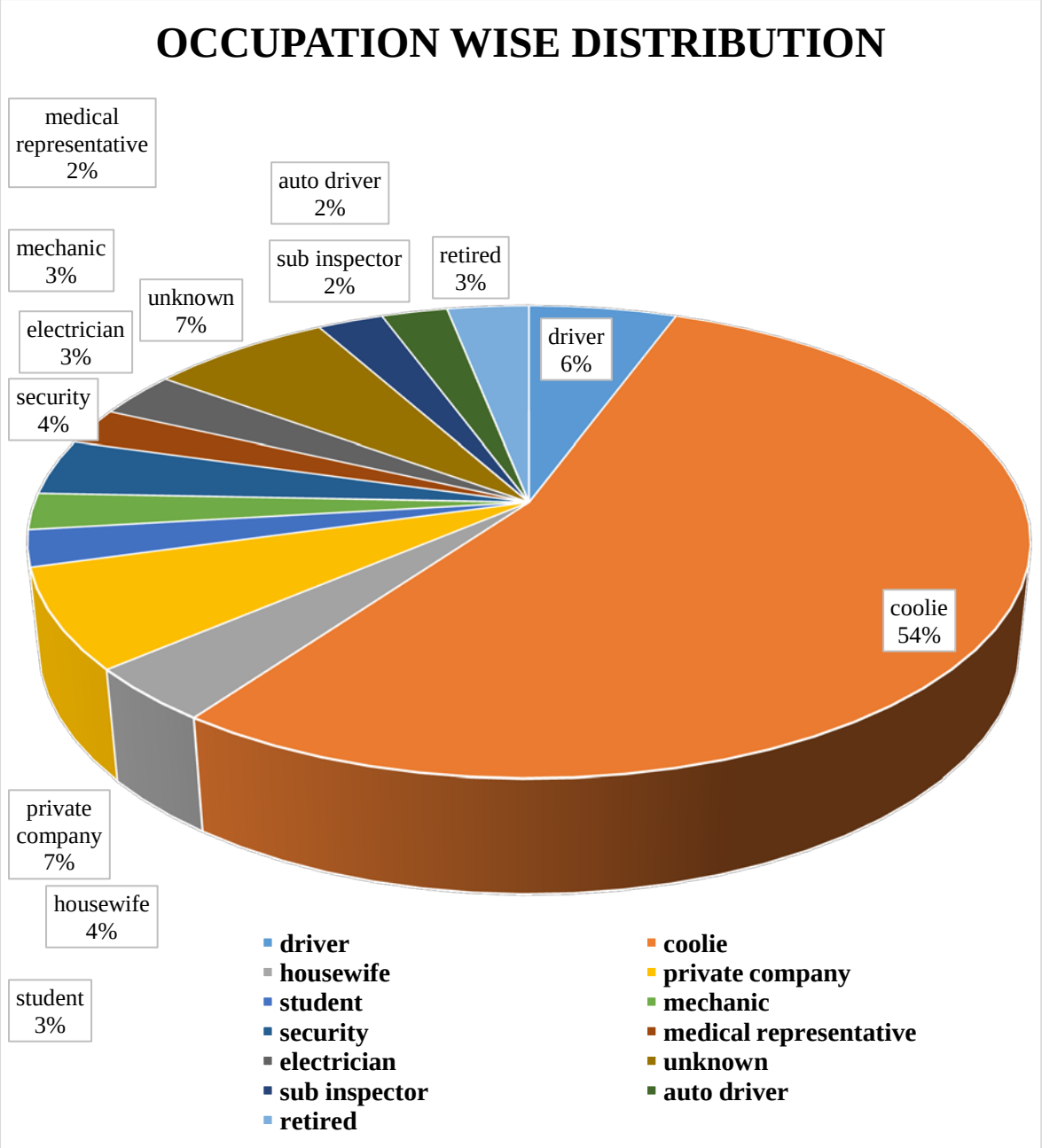


Our study shows that maximum number of railway fatalities occurred during the morning hours, which came to 54.4% of the cases. The least number were during the night hours, i.e., 5 cases which contributed to 3.1% of the total cases.

TABLE 10 : OCCUPATION WISE DISTRIBUTION

Occupation	Number of patients	Percentage (%)
Driver	9	5.6
Coolie	**87**	**54.4**
Housewife	6	3.8
Private company	11	6.9
Student	4	2.5
Mechanic	4	2.5
Security	6	3.8
Medical representative	4	2.5
Electrician	5	3.1
Unknown	11	6.9
Sub inspector	4	2.5
Autodriver	4	2.5
Retired	5	3.1
Total	160	100

FIGURE 16 : OCCUPATION WISE DISTRIBUTION

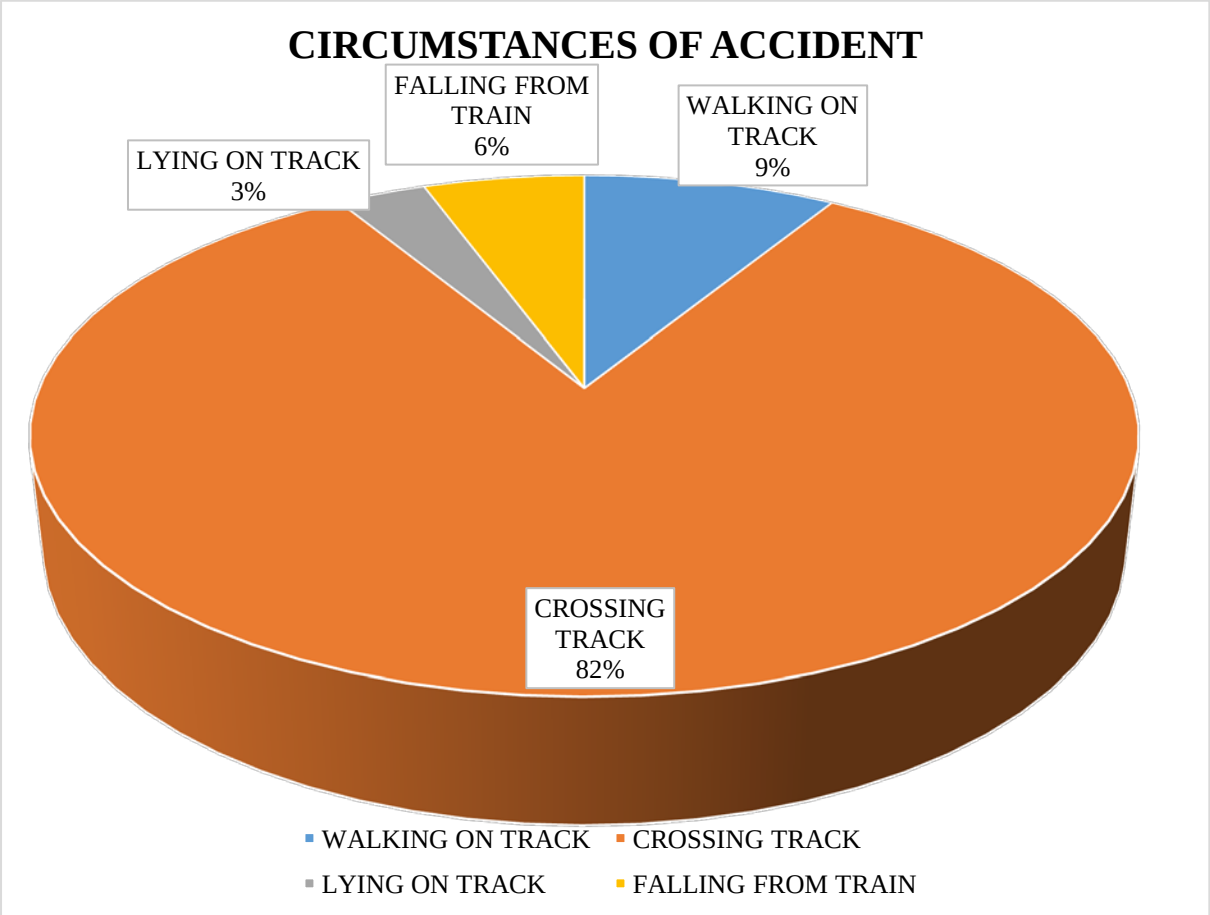


On analysing the occupation of cases of railway fatalities, 54.4% of the cases were daily wages. The least number was contributed by retired people and electricians i.e., 3.1% each.

TABLE11 : CIRCUMSTANCES OF ACCIDENT

Circumstances of accident	Number of patients	Percentage (%)
Walking on track	14	8.8
Crossing the track	**132**	**82.5**
Lying on track	5	3.1
Falling from train	9	5.6
Total	160	100

FIGURE 17: CIRCUMSTANCES OF ACCIDENT



In the present study from the above table, accidental deaths by railway fatalities have occurred while crossing the railway track i.e. 132 deaths (82.5%) followed by those who were hit from behind while walking along the direction of the train on the tracks numbering up to 14 deaths (8.8%).

TABLE12 : PLACE OF DEATH

Place of death	Number of patients	Percentage (%)
Spot dead	**160**	**100**
Total	160	100

From the above table it is evident that all cases were spot dead.

TABLE 13: RAILWAY TRACK CROSSED REGULARLY

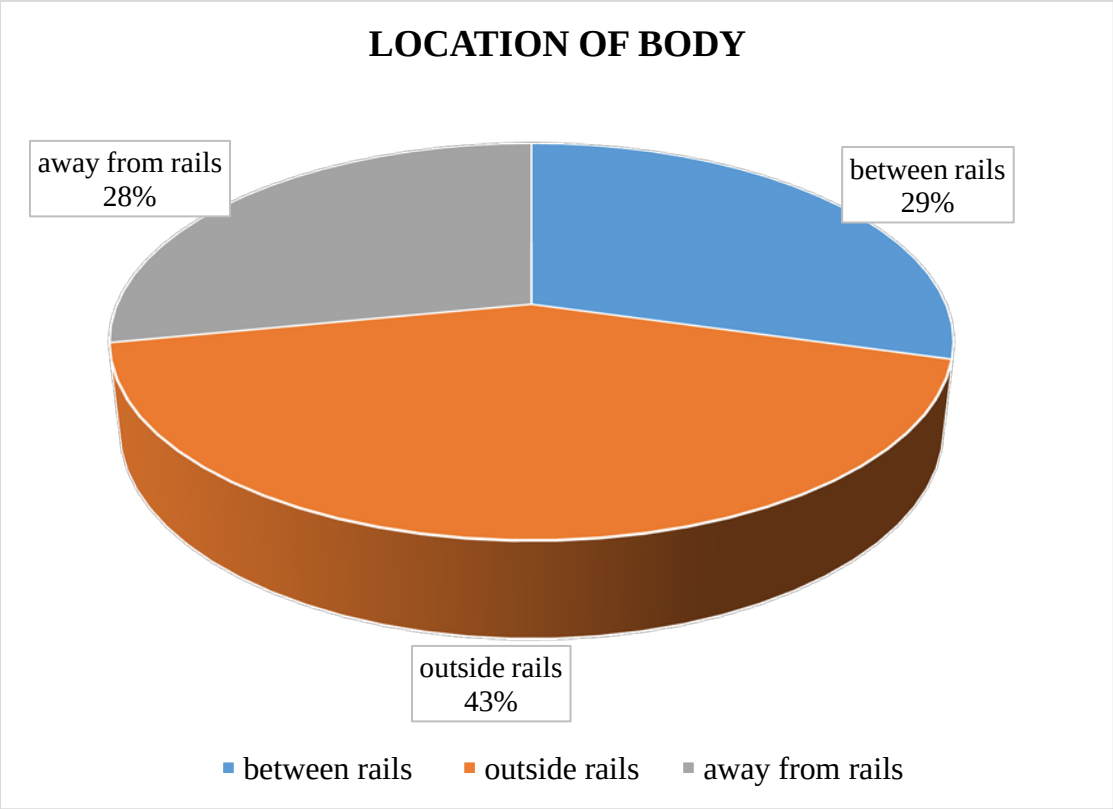
Railway track crossed regularly	Number of patients	Percentage (%)
Yes	**92**	**57.5**
No	68	42.5
Total	160	100

From the above table it is evident that 57.5% of the cases were crossing the railway track regularly.

TABLE14 : LOCATION OF BODY

Location of body	Number of deceased	Percentage (%)
Between rails	47	29.4
Outside rails	**68**	**42.5**
Away from rails	45	28.1
Total	160	100

FIGURE 18: LOCATION OF BODY



From the above table it is clear that, body of 68 cases were found outside the rails, which comes to 42.5%, followed by 29.4% cases in which body was found in between the rails. In the remaining 28.1% cases body was found away from rails.

TABLE15 :EXTERNAL INJURIES (N=160)

External injuries	Number of deceased	Percentage (%)
Abrasions	160	100
Contusions	47	29.4
Lacerations	89	55.6
Swelling & deformity	88	55.0
Decapitation	40	25.0
Crush injury	112	70
Transection	17	10.6

Total cannot be put for this table since more than one injury can be present in the same patient and the injuries are mutually exclusive.

TABLE16: INTERNAL INJURIES WISE (N=160)

Internal injuries	Number of deceased	Percentage (%)
Lung	84	52.5
Liver	96	60
Kidney	41	25.6
Spleen	45	28.1
Brain	93	58.1
Spinal cord	91	56.9
Stomach	5	3.1
Bowel	10	6.2
Fractures	140	87.5
Diaphragm	11	6.9
Heart	15	9.4
Urinary bladder	4	2.5
Testes	1	0.6
Intracranial bleeding	81	50.6
Intrapleural bleeding	75	46.9
Intraperitoneal bleeding	59	36.9

Total cannot be put for this table since more than one injury can be present in the same patient and the injuries are mutually exclusive.

The incidence of various injuries to the different parts of the body and organs are shown in above two tables. Fractures are more common.

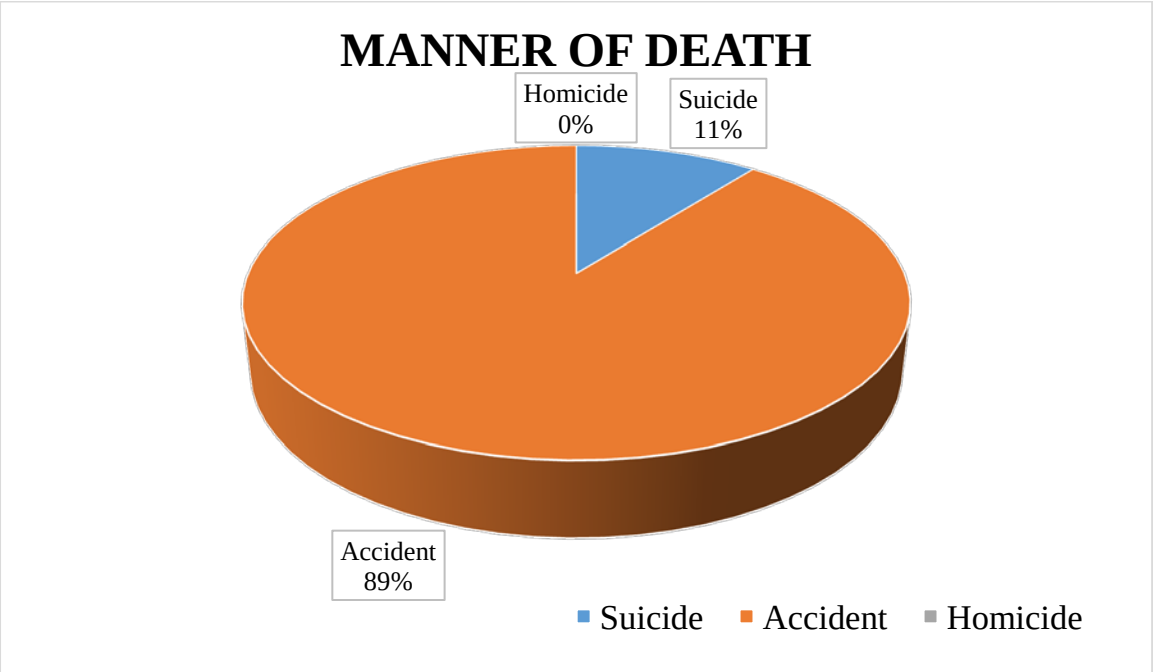
In case of the visceral injuries spinal cord injuries are maximum, because in most cases of the suicides crushing and transection of cervical, thoracic, or lumbar vertebrae are seen. In addition some accidental cases also suffer from spinal cord injuries.

The least injured organs are urinary bladder (4 cases) and testis (1case) as urinary bladder is a pelvic organ, it escapes injury from direct trauma usually injuries associated with fractures. Same in the case with the testis which is usually guarded by both the thighs and rarely there is a possibility of sustaining direct trauma.

TABLE17 : MANNER OF DEATH

Manner of death	Number of patients	Percentage (%)
Suicide	17	10.6
Accident	**143**	**89.4**
Homicide	0	0
Total	160	100

FIGURE19 : MANNER OF DEATH

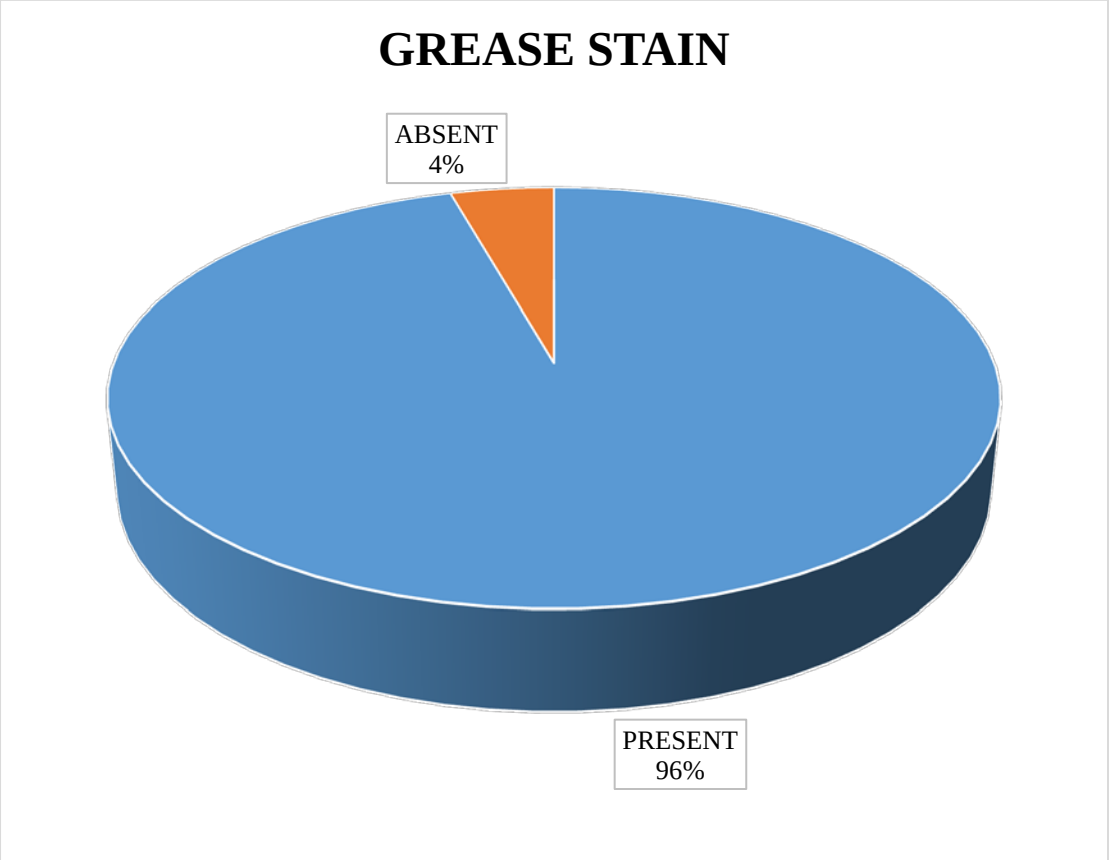


In our study it was seen that, accidental death contributed to the major cause of railway fatalities, which was about 89.4% of railway fatalities. Next common cause was suicidal deaths which contributed to 10.6% of total railway fatalities. Of the 17 suicidal deaths, suicidal note was found in 13 deaths. There were no homicidal deaths.

TABLE18 : GREASE STAIN

Grease stain	Number of patients	Percentage (%)
Present	**153**	**95.6**
Absent	7	4.4
Total	160	100

FIGURE 20 : GREASE STAIN

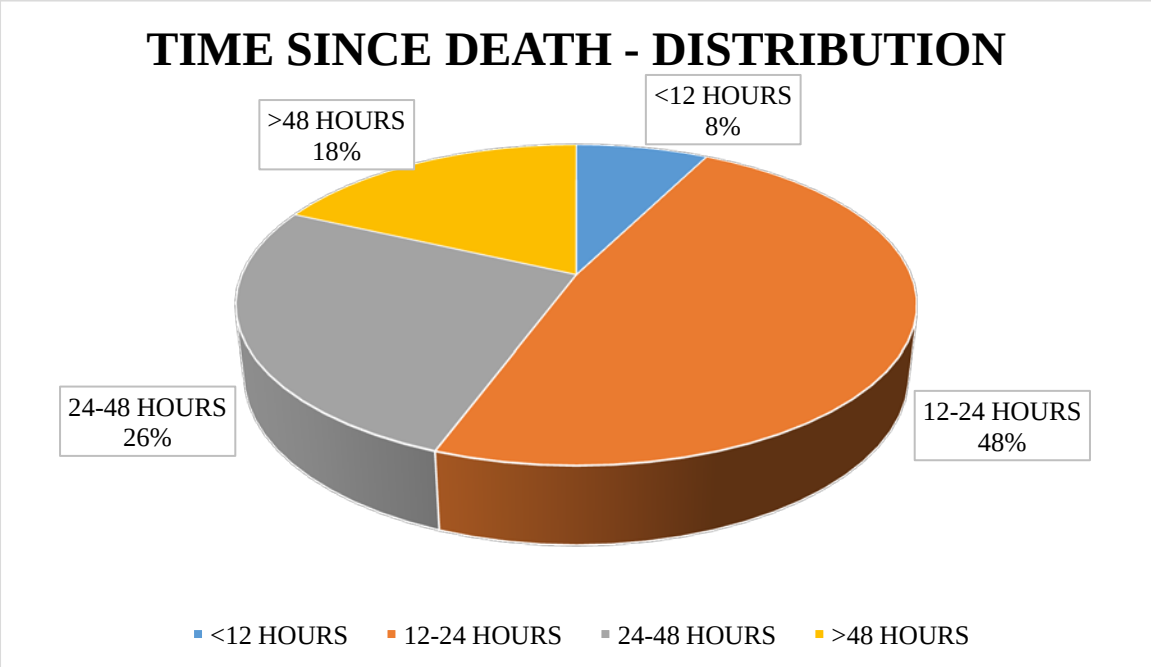


In our study it was seen that the grease stain was present in the clothes of 153 victims of railway fatalities which comes to 95.6%.

TABLE19 : TIME SINCE DEATH

Time since death	Number of patients	Percentage (%)
<12hours	12	7.5
12-24 hours	**77**	**48.1**
24-48hours	42	26.2
>48 hours	29	18.1
Total	160	100

FIGURE 21: TIME SINCE DEATH - DISTRIBUTION

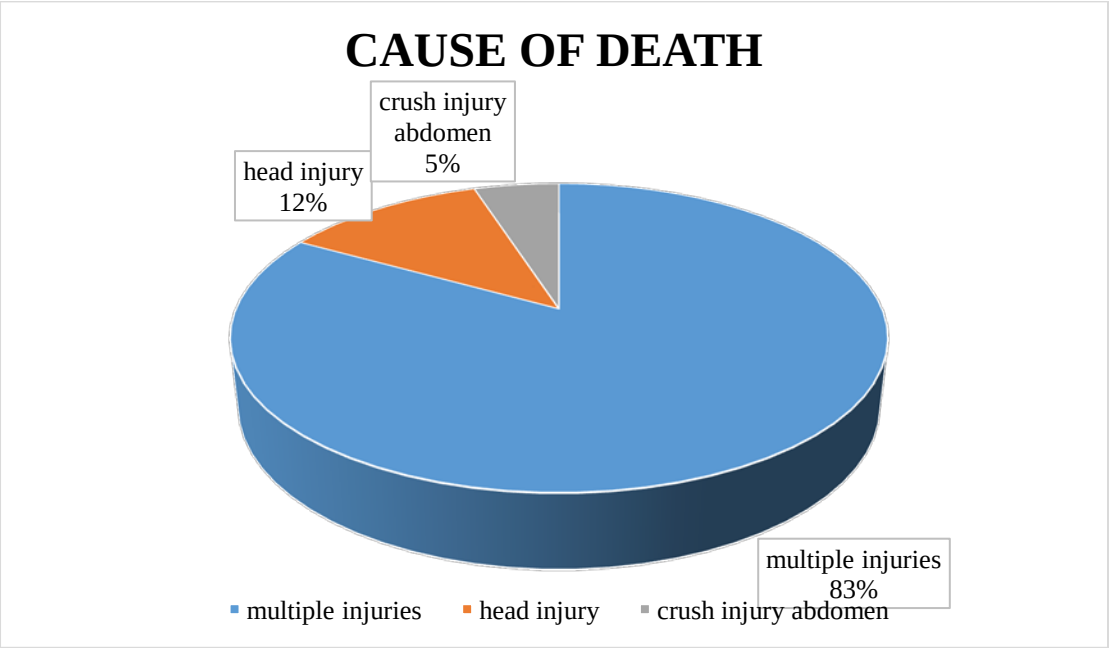


From the above table it is clear that, 48.1% of the victims of railway fatalities died from 12-24 hours.

TABLE 20 : CAUSE OF DEATH

Cause of death	Number of patients	Percentage (%)
Multiple injuries	**133**	**83.1**
Head injury	19	11.9
Crush injury abdomen	8	5.0
Total	160	100

FIGURE 22: CAUSE OF DEATH



Our study showed that, multiple injury was the major cause of death 83.1% of railway fatalities. Next cause of death was head injury which comes to 11.9%.

TABLE 21: MISCELLANEOUS

Miscellaneous	Number of patients	Percentage (%)
Suicidal notes	13	8.1
Witness	0	0
None of the above	147	91.9
Total	160	100

FIGURE 23 : CRUSH INJURY OF RIGHT LEG

FIGURE 24: CRUSH INJURY OF HEAD

FIGURE 25 : CRUSH INJURY OF RIGHT FOOT

FIGURE 26: CRUSH DISMEMBERMENT OF LEFT FOREARM

FIGURE 27: DECAPITATION OF HEAD

FIGUR28: DECAPITATION OF HEAD WITH

MARGINAL GREASE STAIN

FIGURE 29: CRUSH INJURY OF ABDOMEN WITH RIGHT THIGH

FIGURE 30: GREASE STAINED GRAZE ABRASIONS

FIGURE 31: CRUSH INJURY OF HEAD AND RIGHT UPPER LIMB

FIGURE 32: CRUSH INJURY OF HEAD AND FACE

FIGURE 33: MUTILATED BODY

FIGURE 34: TRAUMATIC TRANSECTION AT

THE LEVEL OF ABDOMEN

FIGURE 35: EXTENSIVE CRUSH INJURY WITH

MULTIPLE GREASE STAINS

FIGURE 36: COMPLETE TRANSECTION AT THE LEVEL OF ABDOMEN

FIGURE 37: CRUSH DISMEMBERMENT OF LEFT ARM

DISCUSSION

The railway accident as an agent of traumatic experience occupies an important place in the history of mid- and late-nineteenth-century medical and medico – legal discourses over trauma and traumatic disorder.[33]

In my study, the most common age group is 21-30yrs(26.2%), which was similar to a study conducted by Pelletier A (34).Males were predominant (80.6%), majority of the cases were Hindus (86.9%). In our study most of the victims who succumbed to death due to railway injuries belonged to Hindus followed by Christian's owing to density of Hindu population, which was similar to a study conducted by Puttaswamy.[35]

Of the deceased most of them have studied upto middle school(26.9%). Most the cases in my study belonged to lower socioeconomic class(48.75%).In my study most of the cases were from perambur station (50%).

Most of the cases in my study were during the month of August (20%), most of the railway fatalities occurred during the rainy season (51.9%). Regarding the time of accidents, most of them occurred during the morning hours (54.4%). **Majority of the deceased were coolie** (54.4%).

In my study most of the victims had the habit of crossing track (82.5%). All our cases were spot dead. In most of the cases, the bodies were found to lie outside the railway track (42.5%).

In my study regarding the injuries the most commonly injured organ is Brain (58.1%). Most of them were accidents (89.4%). In (95.6%) of cases grease stain was present.

In my study majority of the victims died of multiple injuries (83.1%) and the time since death was 12-24hours in most of the cases (48.1%).

The study of autopsies from 01-08-2015 to 31-12-2016, indicated out of2845 cases 160cases (5.62%) were brought by railway police. The number of cases in our study was closer to the one studied by Basu, R., Bose, T.K. et al(2002) who found 299 (6.11%) cases of Railway fatalities among a total of 4893

Autopsies at Kolkata between 1-1- 2000 to 30-6-2001 (36). Our study showed more number of cases than the study conducted by Gunajit Das, Nayan Mani Choudhury, SwarajPhukon, JayantaTalukdarat Silchar medical college, Assam, which showed the number of cases to be 65 during the period of 01.01.2009 to 31.12.2013.[37]This study also showed a male predominance (80%), which was similar to our study.

In our study, there were 129 males (80%) & 31 females giving a distinct male preponderance. Male: female ratio was 4:1. As far as the age group was concerned, majority of the patients were in the 21-30 years age group (42 cases) followed by 34 cases in the age group of 41-50 years, 30 cases in the age group 31-40 Years, which is similar to a study conducted by

LERER L.B et al, the railway related deaths at the cape town of South Africa between 1992 to 1994 which showed that most railway fatalities were among men between the ages of 25 – 44 years(21). Male preponderance was also noted in studies conducted by [14,38,39,40,41,42,43,44,45,46,51,52]. Age and Sex incidence of the cases are found to besimilar with the study carried out by Das, G (2007) at Gauhati Medical College, Guwahati during the period 01.06.2005 to 31.05.2006(21).

The information' furnished by police in the inquestreport showed that incidence of deaths due to railway accidents, suicide& homicide were(89.4%), (10.6%), (0%) cases respectively. This was found to co relate with a study conducted by Dr, J.S.Dalal, Dr.H.R.Tejpal, Dr. Ashok Chanana, Dr.Kirpal Singh,Dr,-PuneetKhurana,Dr. Puneet Arora at Government medical college, Amristar which showed that the manner of death in majority of cases were suicidal/accidental which was about (73.1%).[47]

The number of cases were more from the perambur jurisdiction (50%) & 49.4% from avadi jurisdiction. There were more railway fatalities during the month of August(20%)followed by September (11.9%). The least number were during the month of December (2.5%).Rainy season had more railway fatalities (51.9%) followed by summer which had (18.8%) of cases. These accidents occurred more to people who had the habit of crossing the track regularly, which is about (82.5%) of the cases.The accidents occurred more during the morning hours (54.4%) which agrees with the study done by Valsala K, C. S. Sreedevi, Sreelekshmi J[48]and least during the night hours (3.1%).Regarding

the occupation, most of the cases were working as daily wages which contributed to about (54.4%).

Observed causes of death in majority of cases brought by police were due to multiple injuries in (83.1%) cases, head injury in (11.9%) cases & crush injury abdomen in (5%) cases, which was in accordance with the study conducted by M.I. Sheikh, L.V. Shah & Rajesh Patel, which showed that out of 262 cases,(79.32%) of the victims died ofmultiple injuries, head injury, decapitation, crushing of body in parts, blunt injuries transaction of body into two parts[(5)..]All our cases were spot dead which shows the severity of railway accidents, which was similar to a study conducted by Rautji R, Dogra TD.[(49)]In most of the cases bodies were found outside the rails(i.e.,42.5%). Majority of the railway fatalities were accidental in nature, which contributed to (89.4%). The time since death in most of the cases of railway fatalities were 12-24 hours, which was about(48.1%).Electrocution or death by burns or drowning in lake or river (if train falls of a bridge) etc. can also occur in train accidents according to V. Vpillai.[(50)] In my study no case with electrical injury was brought for autopsy, even though the railway lines are electrified in Tamil Nadu.

SUMMARY

- During the period from 1st of August 2015 to 31st of December 2016 (two years) a total of 160 cases reported as Railway Accidents were studied. Railway deaths constituted (5.33%) of the total autopsies conducted during the study period.
- For every female case there were on an average **4 male cases**, showing that males are more prone to Railway Accidents than females.
- The maximum incidence of cases were seen in the **third decade of life** followed by fifth & fourth decades.
- The railway fatalities were more of **accidental in nature**, less frequently suicidal and very rarely homicidal.
- Accidents were more during the **morning hours** when people rush to their workplaces, schools, colleges etc.
- Railway fatalities were more during the **rainy season**.
- **August** was the month with more number of mortality cases.
- The accidental deaths by railway injuries occurred mostly **while crossing the track or walking along the track**
- From the analytical study of the Railway Fatality injuries it was revealed that fractures were most commonly seen.

- Internal organs commonly involved are **spinal cord** followed by brain, intestines, lungs, liver etc.

- It is also found that injuries to the **upper half of the body** are more common when compared to that of lower half of the body.

- **All cases were spot dead which clearly shows the severity of railway injuries.**

RECOMMENDATIONS

- Most of the Railway fatalities are not properly investigated and enough effort is not made by the Police to establish the identity of the victim. Timely establishment of Identity helps in handing over the body to the right relatives and also helps to a very great extent in getting all the needed information to establish the motive behind the death and also the manner of death. Hence it is needless to emphasize the responsibility of the Investigating Officer in establishing the Identity.

- Most of the Railway fatalities are investigated by the lower cadre Police Personnel, usually the head constables, who would perform the task as a routine one and never have a high index of suspicion of a homicide, due to the hassles involved in investigating a homicide. A case booked under Sec.174 Cr.P.C is usually closed in the name of either an accident or suicide and is always a welcome for the Police. In most of the cases the scene panchnama is not properly made, let alone taking the photographs of the scene. The inquest report becomes the main linking evidence in the interpretation of manner of death in the later part of the investigation before and after autopsy. **Hence it is necessary that a Police Officer not below the rank of Sub-Inspector should actively take part in the investigation with integrity. The scene should be investigated properly and photographs particularly (colour) should be taken in different angles as far as possible before shifting the body for autopsy**.

- It is common to see people often crossing the railway track carelessly, just in front of an on-coming running train even when the level crossing gates are closed. It is also common to see the pedestrians and two wheeler drivers crossing the railway track. It is observed that most of the accident victims are illiterate and ignorant people from low socio-economic strata. Greater public awareness and preventive measures may reduce the tremendous human and financial loss incurred due to deaths due Railway Fatalities. Preventive measures should be taken up by installing low lying level crossing gates, alarms, signal lights, warning sign boards etc.

- **Public should be encouraged to use foot-over bridges instead of jumping from platforms and crossing the tacks to reach their platform**. Strong and immediate punishment should be given to those who don't follow this to create the sense of safety. And many such over bridges and flyovers should be constructed wherever the Railway accidents are occurring after taking the required information.

- At the unmanned level crossings there is no one to warn, regarding the fast approaching trains. The accidents are very common at such places, especially due to collision between road traffic and trains. Hence even at unmanned gates, steps should be taken to install warning devices like **sirens, so that the public know that the train is approaching.**

- **Another drawback noticed with the Indian Railways is closure of railway gates sometimes 15 to 30 minutes before a train passes through that point. This results in traffic jams and unrest in the crossing public resulting in unlawful acts of crossing the tracks particularly in urban areas which in turn translates as an increase in the number of Railway Fatalities.** Hence, steps should be taken in such a way that the gates are closed very briefly with a safe breathing time before and after to avoid road traffic congestion. This can be achieved by proper co-ordination among the adjacent Station masters, Train drivers, Guards and also the Points-men when there is an oncoming train.

- Trespassing into Railway property should be strictly avoided by the Railway Protection Force in order to avoid fatalities

- To discourage suicidal deaths steps like

  - Reducing public access to the tracks.
  - **CCTV**(Closed circuit Television installation) focusing the tracks in busy areas.
  - Improving surveillance by the Railway staff.
  - Facilitating emergency stops.
  - Counseling the people having suicidal tendencies, etc.,

Should be done be taken up by both the Railways and also the Non Government Organisations involved in such work.

- Unsafe and adventurous practices like getting up or down a running train, travelling on roof tops and standing or leaning from the doors of the compartments, should be discouraged by educating the public and if required should be penalized. It can be suggested at this juncture that, due to the heavy rush in trains, it is not always possible for the Ticket-collectors and Railway Protection Force to curb such activities, therefore the passengers should also take an initiative to avoid such activities. The Government should give the authority and also the responsibility to any Government Official travelling in a train to indentify and penalize such activities like it was done in the case of smoking in public places.

- Apart from the degree of personal injury, experience of a threat to life, symptoms and problems, immediately after the accidents, difficulty in coping of these thoughts, results in emotional pain. Some survivors also suffer problems of "**Re-living**" the accident. This is important for the coping process. The process includes psychological integration of the accident as an important event of life.

- Therefore to reduce Railway fatalities, a comprehensive and sustainable system should be established by promoting safety engineering and law enforcement particularly in metropolitan railway system.

- Adequate amount of interest should be shown while conducting an autopsy of Railway Fatality case. They should not be considered as just

an extra burden among the other interesting and challenging cases, since these autopsies also have their own challenges.

- Maximum amount of effort should be made from the Forensic Experts perspective to establish the identity in Unknown cases, so that the family members would have the minimum privilege of performing the last rites. By doing so we can also avoid many families from being left puzzled for ages about their missing member or their bodies.

- The autopsy should be carried out in similar lines like any other Medico-Legal case.

- Particular attention should be given to every minute detail, photographs should be taken wherever necessary while conducting the autopsy, needful chemical and histo-pathological examinations should be asked for.

- Necessary steps should be taken to maintain the chain of custody.

- Reconstruction of events at the scene of crime, study of injury pattern on the body, corroborative evidence might lead to correct diagnosis regarding the cause and nature of death, if autopsy is carried out in a proper perspective.

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PROFORMA

Deceased No

Date

Age

0-10 -1

11-20 -2

21-30 -3

31-40 -4

41-50 -5

51-60 -6

61-70 -7

Sex

Male -1

Female -2

Religion

Hindu -1

Christian -2

Muslim -3

Educational qualification

Professional -1

Graduate/ post graduate-2

post high school diploma-3

High school certificate-4

Middle school certificate-5

Primary school certificate-6

Illiterate-7

Unknown-8

Socioeconomic status

Upper -1

Upper middle-2

Lower middle-3

Upper lower-4

Lower-5

Unknown-6

Station

Avadi-1

Perambur-2

Egmore -3

Date of accident

Month of accident

January-1

February-2

March-3

April-4

May-5

June-6

July-7

August-8

September-9

October-10

November-11

December-12

Season of accident

- Summer (march-may)-1
- Rainy(june-september)-2
- Autumn(October-november)-3
- Winter(December-february)-4

Time of accident

- Morning(5am-12pm)-1
- Afternoon(12pm-5pm)-2
- Evening(5pm-10pm)-3
- Night(10pm-5am)-4

Occupation

- Driver-1
- Coolie-2
- Housewife-3
- Private company-4
- Student-5
- Mechanic-6
- Security-7
- Medical representative-8
- Electrician-9
- Unknown-10
- Sub inspector-11
- Autodriver-12
- Retired -13

Circumstances of accident

- Walking on track-1
- Crossing the track-2

Walking by the side of the track-3

Lying on track-4

Falling from train-5

Leaning on door-6

Place of death

Spot dead-1

During transportation-2

After admission-3

Railway track crossed regularly

Yes-1

No-2

Location of body at scene of crime

Between rails-1

Outside rails-2

Away from rails-3

Manner of death

Suicide-1

Homicide-2

Accident-3

External injuries

Abrasions-1

Contusions-2

Lacerations-3

Swelling&deformity-4

Amputation-5

Decapitation-6

Perforated crush injury-7

Transection-8

Internal injuries

- Lung-1
- Liver-2
- Kidney-3
- Spleen-4
- Brain-5
- Stomach-6
- Bowel-7
- Fractures-8
- Spinal cord-9
- Heart-10
- Diaphragm-11
- Urinary bladder-12
- Testis-13
- Intracranial bleeding-14
- Intrapleural bleeding-15
- Intraperitoneal bleeding-16

Grease stain

- Present-1
- Absent-2

PM changes

- Rigor mortis
  - Upperlimb-1
  - Lowerlimb-2
  - Passed-3
- Decomposition-4

Time since death

<12hrs-1

12-24hrs-2

24-48hrs-3

>48hrs-4

Cause of death

Multiple injuries-1

Head injury-2

Crush injury abdomen-3

Miscellaneous

Suicidal notes-1

Witness-2

Sl.No.	Deceased	Date	Age	Sex	Religion	educational qualification	socioeconomic status	Station	Date of Accident	month of accident	season of accident	Time of accident	Occupation	Circumstances	Place of Death	Railway Track-Crossed Regularly	Location Of Body @ Scene of crir	Manner of Death	External Injuries	Internal Injuries	Grease stain	transection level	PM Changes	Time Since Death	Cause of death	Miscellaneous
1	1	08-08-2015	4	1	2	5	5	2	08-08-2015	8	2	1	1	2	1	1	3	3	1,2,4,7	8,9	1	0	1,2	2	1	0
2	2	09-08-2015	6	1	1	4	5	2	09-08-2015	8	2	2	7	4	1	2	1	1	1,4,6	1,5,8,9,10,14,15	1	1	3,4	3	1	1
3	3	10-08-2015	5	2	2	2	4	1	10-08-2015	8	2	1	8	2	1	1	2	3	7	1,5,8,9,14,15	1	0	1,2	2	2	0
4	4	12-08-2015	4	1	1	6	5	1	12-08-2015	8	2	3	2	2	1	1	3	3	1,3,4,7	1,8,15	1	0	1,2	2	1	0
5	5	11-08-2015	6	1	1	5	4	2	11-08-2015	8	2	1	2	2	1	1	2	3	1,3,4,6,7	2,4,5,8,9,14,16	1	1	1,2	3	1	0
6	6	17-08-2015	3	1	1	2	3	1	17-08-2015	8	2	2	5	2	1	1	1	3	1,3,4	1,8,15	1	0	1,2	2	1	0
7	7	26-07-2015	4	1	1	6	5	2	26-08-2015	8	2	1	2	2	1	1	3	3	1,7	2,3,4,5,7,9,14,16	1	0	3,4	4	1	0
8	8	25-08-2015	3	1	1	7	5	1	25-08-2015	8	2	1	2	2	1	1	2	3	1,7,8	2,3,4,7,9,16	1	2	3,4	2	2	0
9	9	12-08-2015	4	2	1	6	5	2	12-08-2015	8	2	2	3	1	1	2	3	3	3,4,5,7	2,5,8,9,10,11,15,16	1	0	1,2	2	1	0
10	10	25-08-2015	7	1	1	7	4	1	25-08-2015	8	2	2	3	2	1	2	1	3	1,3,4	1,5,8,14,15	1	0	2	3	1	0
11	11	17-08-2015	6	2	1	4	4	2	17-08-2015	8	2	1	2	1	1	1	2	3	7	5,9,14	1	0	3,4	4	2	0
12	12	04-09-2015	2	1	2	6	5	1	04-09-2015	9	2	4	6	2	1	1	2	3	1,2,4,7	2,3,4,5,9,16	1	0	1,2	2	1	0
13	13	03-09-2015	5	1	2	5	4	1	03-09-2015	9	2	1	2	2	1	1	3	3	1,37	8,9,10,11,12,14,15	1	2	2	3	1	0
14	14	08-09-2015	3	1	2	4	4	1	08-09-2015	9	2	2	2	2	1	1	2	3	1,2,3,6,7	2,5,8	1	1	1,2	2	1	0
15	15	14-09-2015	3	1	1	6	4	1	14-09-2015	9	2	2	2	5	1	1	2	3	1,3	3,5,8,6,9,14	1	0	1,2	2	1	0
16	16	12-09-2015	3	1	3	5	4	2	12-09-2015	9	2	2	1	2	1	2	2	3	1,3,7	2,5,8,9,10,14,15,16	1	0	1,2	3	1	0
17	17	12-09-2015	3	1	1	5	4	2	12-09-2015	9	2	1	2	2	1	1	1	3	1,2,4	1,8,9,15	1	0	3,4	3	1	0
18	18	16-09-2015	5	1	1	6	5	2	16-09-2015	9	2	2	9	2	1	1	3	1	1,6,8	2,3,4,5,8,9,14,16	1	3	3	2	1	1
19	19	02-09-2015	3	1	2	8	5	2	02-09-2015	9	2	1	10	2	1	1	1	3	2,3,6,7	2,3,4,5,8,14,16	1	1	3,4	4	1	0
20	20	18-09-2015	3	1	1	3	4	1	18-09-2015	9	2	1	2	2	1	2	3	3	1,3,6	1,2,5,8,9,15	2	1	1,2	2	1	0
21	21	21-09-2015	3	1	1	3	3	2	21-09-2015	9	2	1	4	2	1	2	2	1	2,3,4,7,8	1,2,8,9,15,16	1	2	1	2	3	0
22	22	21-09-2015	5	1	1	6	5	2	21-09-2015	9	2	1	2	2	1	2	1	3	1,2,4,7	1,2,5,8,14,15,16	1	0	1,2	2	1	0
23	23	23-09-2015	4	1	3	5	4	2	23-09-2015	9	2	2	2	2	1	1	1	3	1,4,7,8	2,5,8,9,14,16	1	2	1,2	2	1	0

24	24	17-09-2015	6	1	1	6	5	2	17-09-2015	9	2	3	2	2	1	2	2	3	1,3,4,7	8,9	1	0	1,2	4	1	0
25	25	27-09-2015	6	1	1	4	4	1	27-09-2015	9	2	1	2	2	1	2	1	3	2,3,4,7	8,9	1	0	3,4	4	2	0
26	26	15-09-2015	3	1	1	8	6	2	15-09-2015	9	2	1	10	2	1	1	1	3	2,3,6,7	2,3,4,5,8,14,16	1	0	3,4	4	1	0
27	27	05-10-2015	5	1	1	2	2	1	05-10-2015	10	3	1	11	2	1	2	1	1	6	8,9	1	1	3	1	3	1
28	28	05-10-2015	4	1	1	4	5	1	05-10-2015	10	3	1	12	2	1	2	2	3	1,2,4,7	2,8	1	0	1,2	1	1	0
29	29	05-10-2015	2	1	1	6	5	1	05-10-2015	10	3	1	2	5	1	2	2	3	1,2,4	4,5,8,9,14	1	0	1,2	1	1	0
30	30	28-09-2015	5	1	1	8	6	2	28-09-2015	9	2	3	2	2	1	1	3	3	4,7	,2,3,5,8,9,14,15,16	1	0	1,2	4	1	0
31	31	14-10-2015	7	1	1	5	4	1	14-10-2015	10	3	2	13	1	1	1	2	3	1,3	2,5,8,9,10,11,14,15	1	0	1,2	2	1	0
32	32	25-10-2015	5	1	2	5	4	1	25-10-2015	10	3	1	2	2	1	2	3	3	1,3,7	1,2,8,9,15	1	0	1,2	3	1	0
33	33	28-10-2015	7	1	1	5	5	1	28-10-2015	10	3	3	2	2	1	2	2	3	1,3,7	1,2,5,8,14,15,16	1	0	1,2	3	1	0
34	34	31-10-2015	7	1	1	5	5	2	31-10-2015	10	3	1	13	2	1	2	3	3	1,4,7	1,2,8,9,15	1	0	1,2	2	1	0
35	35	01-11-2015	7	1	1	7	5	1	01-11-2015	11	3	3	2	2	1	2	1	3	1,3,4	1,2,5,8,14,15,16	1	0	1,2	3	1	0
36	36	06-11-2015	5	1	1	5	5	2	06-11-2015	11	3	1	2	2	1	1	2	3	1,3,4	1,4,8,9,15	1	0	1,2	2	1	0
37	37	08-01-2016	6	1	1	4	5	2	08-01-2016	1	4	1	1	2	1	1	3	3	1,2,4,7	8,9	1	0	1,2	2	1	0
38	38	08-01-2016	4	2	1	6	5	2	08-01-2016	1	4	2	7	4	1	2	1	1	1,4,6	1,5,8,9,14,15	1	1	3,4	3	1	1
39	39	13-01-2016	6	1	1	2	3	2	13-01-2016	1	4	1	8	2	1	1	2	3	7	1,8,15	1	0	1,2	2	2	0
40	40	15-01-2016	5	1	1	5	5	1	15-01-2016	1	4	3	2	2	1	1	3	3	1,3,4,7	1,5,8,9,14,15	1	0	1,2	2	1	0
41	41	17-01-2016	4	2	1	6	5	1	17-01-2016	1	4	1	2	2	1	1	2	3	1,3,4,6,7	2,4,5,8,9,16	1	0	1,2	3	1	0
42	42	19-01-2016	6	1	1	5	5	2	19-01-2016	1	4	2	7	2	1	1	1	3	1,3,4	1,8,15	1	0	1,2	2	1	0
43	43	20-01-2016	3	1	1	4	5	1	20-01-2016	1	4	1	2	2	1	1	3	3	1,7	2,3,4,5,7,9,14,16	1	0	3,4	4	1	0
44	44	24-01-2016	5	1	1	6	5	2	24-01-2016	1	4	1	2	2	1	1	2	3	1,7,8	2,3,4,7,16	1	2	3,4	2	2	0
45	45	25-01-2016	3	1	1	2	3	1	25-01-2016	1	4	2	3	1	1	2	3	3	3,4,5,7	1,2,5,8,9,14,15,16	1	0	1,2	2	1	0
46	46	25-01-2016	3	1	1	4	4	2	25-01-2016	1	4	2	3	2	1	2	1	3	1,3,4	1,5,8,10,14,15	1	0	2	3	1	0
47	47	29-01-2016	4	1	1	6	5	1	29-01-2016	1	4	1	2	1	1	1	2	3	7	5,9,14	1	0	3,4	4	2	0
48	48	30-01-2016	7	1	1	8	6	2	30-01-2016	1	4	4	6	2	1	1	2	3	1,2,4,7	2,3,4,5,9,14,16	1	0	1,2	2	1	0
49	49	31-01-2016	6	1	1	7	5	1	31-01-2016	1	4	1	2	2	1	1	3	3	1,3,7	1,2,3,4,8,15,16	1	0	2	3	1	0
50	50	07-02-2016	5	1	1	5	5	1	07-02-2016	2	4	2	2	2	1	1	2	3	1,2,3,6,7	2,5,8,14	1	0	1,2	2	1	0
51	51	08-02-2016	3	1	1	6	5	1	08-02-2016	2	4	2	2	5	1	1	2	3	1,3	3,5,8,6,9,14	2	0	1,2	2	1	0
52	52	13-02-2016	3	1	1	5	5	1	13-02-2016	2	4	2	1	2	1	2	2	3	1,3,7	1,2,5,8,14,15,16	1	0	1,2	3	1	0
53	53	17-02-2016	3	1	1	4	4	2	17-02-2016	2	4	1	2	2	1	1	1	3	1,2,4	1,8,9,15	1	0	3,4	3	1	0
54	54	20-02-2016	5	1	1	4	4	2	20-02-2016	2	4	2	9	2	1	1	3	1	1,6,8	2,3,4,5,8,9,14	1	3	3	2	1	1
55	55	21-02-2016	7	1	1	8	6	2	21-02-2016	2	4	1	10	2	1	1	1	3	2,3,6,7	2,3,4,8,16	1	1	3,4	4	1	0

56	56	22-02-2016	5	1	2	6	5	2	22-02-2016	2	4	1	2	2	1	2	3	3	1,3,6	1,2,5,8,9,14,15	1	1	1,2	2	1	0
57	57	23-02-2016	5	1	1	3	4	1	23-02-2016	2	4	1	4	2	1	2	2	1	2,3,4,7,8	1,2,8,15	1	2	1	2	3	0
58	58	26-02-2016	3	1	2	6	5	2	26-02-2016	2	4	1	2	2	1	2	1	3	1,2,4,7	1,2,5,8,9,14,15,16	1	0	1,2	2	1	0
59	59	27-02-2016	3	1	1	5	5	2	27-02-2016	2	4	2	2	2	1	1	1	3	1,4,7,8	2,5,8,9,14,16	1	2	1,2	2	1	0
60	60	02-03-2016	3	2	1	5	5	2	02-03-2016	3	1	3	2	2	1	2	2	3	1,3,4,7	8	1	0	1,2	4	1	0
61	61	14-03-2016	5	2	2	7	5	2	14-03-2016	3	1	1	2	2	1	2	1	3	2,3,4,7	5,8,9,14	1	0	3,4	4	2	0
62	62	15-03-2016	7	1	1	8	6	1	15-03-2016	3	1	1	10	2	1	1	1	3	2,3,6,7	2,3,4,5,8,14,16	1	0	3,4	4	1	0
63	63	16-03-2016	7	1	2	8	6	2	16-03-2016	3	1	1	11	2	1	2	1	1	6	8,9	1	1	3	1	3	1
64	64	17-03-2016	7	1	1	8	6	1	17-03-2016	3	1	1	12	2	1	2	2	3	1,2,4,7	2,5,8,14,16	1	0	1,2	1	1	0
65	65	17-03-2016	6	1	1	6	4	1	17-03-2016	3	1	1	2	5	1	2	2	3	1,2,4	4,8	1	0	1,2	1	1	0
66	66	20-03-2016	6	2	1	8	6	1	20-03-2016	3	1	3	2	2	1	1	3	3	4,7	3,5,8,9,10,11,14,15	1	0	1,2	4	1	0
67	67	21-03-2016	3	1	3	8	6	2	21-03-2016	3	1	2	5	1	1	1	2	3	1,3	1,2,8,15	1	0	1,2	2	1	0
68	68	21-03-2016	5	2	1	8	6	1	21-03-2016	3	1	1	2	2	1	2	3	3	1,3,7	1,2,5,8,9,14,15	1	0	1,2	3	1	0
69	69	21-03-2016	4	1	1	8	6	1	21-03-2016	3	1	3	10	2	1	2	2	3	1,3,7	1,2,8,15	1	0	1,2	3	1	0
70	70	01-04-2016	2	1	1	5	5	1	01-04-2016	4	1	1	6	2	1	2	3	3	1,4,7	1,2,5,8,15,16	2	0	1,2	2	1	0
71	71	11-04-2016	5	1	1	4	5	2	11-04-2016	4	1	3	2	2	1	2	1	3	1,3,4	1,2,5,8,9,15	1	0	1,2	3	1	0
72	72	12-04-2016	7	1	1	8	6	1	12-04-2016	4	1	1	10	2	1	1	2	3	1,3,4	1,4,5,8,9,14,15	1	0	1,2	2	1	0
73	73	15-04-2016	5	1	1	4	4	2	15-04-2016	4	1	1	1	2	1	1	3	3	1,2,4,7	8	1	0	1,2	2	1	0
74	74	17-04-2016	4	1	1	4	4	2	17-04-2016	4	1	2	7	4	1	2	1	1	1,4,6	1,8,15	1	1	3,4	3	1	1
75	75	22-04-2016	6	1	1	2	3	2	22-04-2016	4	1	1	8	2	1	1	2	3	7	1,5,8,9,10,14,15	1	0	1,2	2	2	0
76	76	24-04-2016	5	2	1	5	5	2	24-04-2016	4	1	3	2	2	1	1	3	3	1,3,4,7	1,5,8,15	1	0	1,2	2	1	0
77	77	25-04-2016	4	1	1	5	5	1	25-04-2016	4	1	1	2	2	1	1	2	3	1,3,4,6,7	2,4,5,8,9,14,16	1	1	1,2	3	1	0
78	78	27-04-2016	6	2	1	6	5	1	27-04-2016	4	1	2	2	2	1	1	1	3	1,3,4	1,8,15	1	0	1,2	2	1	0
79	79	29-04-2016	3	1	1	4	4	2	29-04-2016	4	1	1	2	2	1	1	3	3	1,7	2,3,4,5,7,14,16	1	0	3,4	4	1	0
80	80	12-05-2016	4	1	1	8	6	1	12-05-2016	5	1	1	10	2	1	1	2	3	1,7,8	2,3,4,7,9,16	1	2	3,4	2	2	0
81	81	15-05-2016	3	1	1	3	4	2	15-05-2016	5	1	2	4	1	1	2	3	3	3,4,5,7	1,2,5,8,9,14,15	1	0	1,2	2	1	0
82	82	16-05-2016	4	2	1	4	2	1	16-05-2016	5	1	2	3	2	1	2	1	3	1,3,4	1,5,8,9,14,15	1	0	2	3	1	0
83	83	19-05-2016	7	1	1	7	5	2	19-05-2016	5	1	1	2	1	1	1	2	3	7	5	1	0	3,4	4	2	0
84	84	20-05-2016	6	2	2	8	6	1	20-05-2016	5	1	4	10	2	1	1	2	3	1,2,4,7	2,3,4,5,14,16	1	0	1,2	2	1	0
85	85	20-05-2016	2	1	1	5	5	2	20-05-2016	5	1	1	2	2	1	1	3	3	1,3,7	8,9,10,11,12,14,15	1	0	2	3	1	0
86	86	23-05-2016	5	2	1	6	5	1	23-05-2016	5	1	2	2	2	1	1	2	3	1,2,3,6,7	2,5,8,9,14,16	1	1	1,2	2	1	0
87	87	23-05-2016	3	1	1	5	5	1	23-05-2016	5	1	2	2	5	1	1	2	3	1,3	3,5,8,6,9,14	1	0	1,2	2	1	0

88	88	30-05-2016	5	2	1	4	4	1	30-05-2016	5	1	2	1	2	1	2	2	3	1,3,7	1,2,8,15	1	0	1,2	3	1	0
89	89	31-05-2016	6	1	1	6	5	1	31-05-2016	5	1	1	2	2	1	1	1	3	1,2,4	1,5,8,14,15	2	0	3,4	3	1	0
90	90	01-06-2016	7	2	1	4	4	2	01-06-2016	6	2	2	9	2	1	1	3	1	1,6,8	2,3,4,8,9,16	1	3	3	2	1	1
91	91	02-06-2016	3	1	1	8	6	2	02-06-2016	6	2	1	10	2	1	1	1	3	2,3,6,7	2,3,4,5,8,14,16	1	1	3,4	4	1	0
92	92	04-06-2016	4	1	1	5	5	2	04-06-2016	6	2	1	2	2	1	2	3	3	1,3,6	1,2,8,15	1	1	1,2	2	1	0
93	93	07-06-2016	3	1	1	3	4	2	07-06-2016	6	2	1	4	2	1	2	2	1	2,3,4,7,8	1,2,5,8,9,10,14,15	1	2	1	2	3	0
94	94	09-06-2016	3	1	1	4	5	1	09-06-2016	6	2	1	2	2	1	2	1	3	1,2,4,7	1,2,8,15	1	0	1,2	2	1	0
95	95	11-06-2016	4	2	1	5	5	2	11-06-2016	6	2	2	2	2	1	1	1	3	1,4,7,8	2,5,8,9,14,16	1	2	1,2	2	1	0
96	96	13-06-2016	6	1	1	7	5	2	13-06-2016	6	2	3	2	2	1	2	2	3	1,3,4,7	8	1	0	1,2	4	1	0
97	97	16-06-2016	3	1	1	4	5	2	16-06-2016	6	2	1	2	2	1	2	1	3	2,3,4,7	8	1	0	3,4	4	2	0
98	98	19-06-2016	5	1	1	5	5	2	19-06-2016	6	2	1	12	2	1	2	2	3	1,2,4,7	2,5,8,9,14,16	1	0	1,2	1	1	0
99	99	21-06-2016	6	2	1	5	5	1	21-06-2016	6	2	1	2	5	1	2	2	3	1,2,4	4,8,9	1	0	1,2	1	1	0
100	100	23-06-2016	7	1	1	6	5	2	23-06-2016	6	2	1	2	2	1	1	3	3	4,7	2,3,8,9,10,11,14,15	1	0	1,2	4	1	0
101	101	25-06-2016	4	1	1	3	4	1	25-06-2016	6	2	1	4	1	1	1	2	3	1,3	1,2,8,15	1	0	1,2	2	1	0
102	102	27-06-2016	3	1	1	5	5	1	27-06-2016	6	2	3	2	2	1	2	3	3	1,3,7	1,2,5,8,9,14,15	1	0	1,2	3	1	0
103	103	27-06-2016	7	2	1	6	5	1	27-06-2016	6	2	2	2	2	1	2	2	3	1,3,7	1,2,8,15	1	0	1,2	3	1	0
104	104	29-06-2016	7	1	1	3	3	2	29-06-2016	6	2	1	13	2	1	2	3	3	1,4,7	1,2,8,9,15	1	0	1,2	2	1	0
105	105	30-01-2016	4	1	1	4	5	1	30-07-2016	7	2	3	2	2	1	2	1	3	1,3,4	1,2,8	2	0	1,2	3	1	0
106	106	01-07-2016	3	1	1	4	4	1	01-07-2016	7	2	1	2	2	1	1	2	3	1,3,4	4,5,8,9,10,11,14,15	1	0	1,2	2	1	0
107	107	03-07-2016	7	1	1	4	4	1	03-07-2016	7	2	3	1	2	1	1	3	3	1,2,4,7	8	1	0	1,2	2	1	0
108	108	06-07-2016	4	1	1	4	5	2	06-07-2016	7	2	1	2	2	1	1	3	3	1,3,4,7	1,8	1	0	1,2	2	1	0
109	109	08-07-2016	6	1	1	7	5	1	08-07-2016	7	2	1	2	2	1	1	2	3	1,3,4,6,7	2,4,5,6,8,9,14,16	1	1	1,2	3	1	0
110	110	09-07-2016	3	1	1	1	2	2	09-07-2016	7	2	2	5	2	1	1	1	3	1,3,4	1,8,9,15	1	0	1,2	2	1	0
111	111	11-07-2016	6	2	1	5	5	2	11-07-2016	7	2	1	2	2	1	1	3	3	1,7	2,3,4,7,16	1	0	3,4	4	1	0
112	112	11-07-2016	5	1	3	4	4	2	11-07-2016	7	2	3	2	2	1	1	2	3	1,7,8	2,3,4,5,7,9,14,16	1	2	3,4	2	2	0
113	113	13-07-2016	3	1	1	4	4	2	13-07-2016	7	2	1	4	1	1	2	3	3	3,4,5,7	1,2,8,15	1	0	1,2	2	1	0
114	114	15/07/2016+	3	2	1	4	4	1	15-07-2017	7	2	2	4	2	1	2	1	3	1,3,4	1,5,8,9,14,15	1	0	2	3	1	0
115	115	17-07-2016	3	1	1	5	5	1	17-07-2016	7	2	1	2	1	1	1	2	3	7	5	1	0	3,4	4	2	0
116	116	19-07-2016	5	1	1	5	4	2	19-07-2016	7	2	1	6	2	1	1	2	3	1,2,4,7	2,3,4,5,14,16	1	0	1,2	2	1	0
117	117	21-07-2016	7	1	2	5	4	1	21-07-2016	7	2	2	2	2	1	1	3	3	1,3,7	1,2,3,4,8,9,15,16	1	0	2	3	1	0
118	118	23-07-2016	5	1	1	4	4	2	23-07-2016	7	2	2	2	2	1	1	2	3	1,2,3,6,7	2,5,8,9,14,16	1	1	1,2	2	1	0
119	119	26-07-2016	5	2	1	4	4	1	26-07-2016	7	2	1	2	5	1	1	2	3	1,3	3,5,8,6,9,14	1	0	1,2	2	1	0

120	120	29-07-2016	5	2	1	5	5	2	29-07-2016	7	2	4	2	2	1	2	2	3	1,3,7	1,2,8,9,15	1	0	1,2	3	1	0
121	121	30-07-2016	4	1	1	5	4	1	30-07-2016	7	2	1	2	2	1	1	1	3	1,2,4	1,8,15	1	0	3,4	3	1	0
122	122	01-08-2016	6	1	1	5	4	2	01-08-2016	8	2	2	9	2	1	1	3	1	1,6,8	2,3,4,5,8,14,16	2	3	3	2	1	1
123	123	03-08-2016	3	1	1	3	3	1	03-08-2016	8	2	2	4	2	1	2	2	1	2,3,4,7,8	1,2,8,9,10,11,12,15	1	2	1	2	3	0
124	124	04-08-2016	4	1	1	5	5	1	04-08-2016	8	2	2	2	2	1	2	1	3	1,2,4,7	1,2,5,8,14,15,16	1	0	1,2	2	1	0
125	125	06-08-2016	7	1	1	7	5	1	06-08-2016	8	2	1	2	2	1	1	1	3	1,4,7,8	2,5,8,9,14,16	1	2	1,2	2	1	0
126	126	08-08-2016	6	1	1	4	4	1	08-08-2016	8	2	2	2	2	1	2	2	3	1,3,4,7	8	1	0	1,2	4	1	0
127	127	09-08-2016	2	1	1	4	5	2	09-08-2016	8	2	1	2	2	1	2	1	3	2,3,4,7	8	1	0	3,4	4	2	0
128	128	11-08-2016	5	1	1	8	6	2	11-08-2016	8	2	1	10	2	1	1	1	3	2,3,6,7	2,3,4,5,8,9,14,16	1	1	3,4	4	1	0
129	129	12-08-2016	3	1	2	2	2	2	12-08-2016	8	2	1	11	2	1	2	1	1	6	8	1	1	3	1	3	1
130	130	13-08-2016	3	2	1	4	5	2	13-08-2016	8	2	1	4	2	1	2	2	3	1,2,4,7	2,5,8,14,16	1	0	1,2	1	1	0
131	131	14-08-2016	5	2	1	7	5	1	14-08-2016	8	2	2	2	5	1	2	2	3	1,2,4	4,8,9	1	0	1,2	1	1	0
132	132	15-08-2016	3	1	1	4	5	2	15-08-2016	8	2	3	2	2	1	1	3	3	4,7	1,2,3,5,8,14,15,16	1	0	1,2	3	1	0
133	133	17-08-2016	7	1	1	6	4	2	17-08-2016	8	2	1	2	2	1	2	2	3	1,3,7	1,2,8,9,15	1	0	1,2	3	1	0
134	134	17-08-2016	6	1	1	3	3	2	17-08-2016	8	2	1	13	2	1	2	3	3	1,4,7	1,2,8	1	0	1,2	2	1	0
135	135	19-08-2016	5	2	1	4	4	2	19-08-2016	8	2	1	2	2	1	2	1	3	1,3,4	2,5,8,9,10,11,14,15	1	0	1,2	3	1	0
136	136	21-08-2016	3	2	1	5	5	1	21-08-2016	8	2	1	2	2	1	1	2	3	1,3,4	1,4,8	1	0	1,2	2	1	0
137	137	22-08-2016	3	1	1	3	4	2	22-08-2016	8	2	1	1	2	1	1	3	3	1,2,4,7	8	1	0	1,2	2	1	0
138	138	24-08-2016	3	1	1	5	5	1	24-08-2016	8	2	3	7	4	1	2	1	1	1,4,6	1,8,9	1	1	3,4	3	1	1
139	139	26-08-2016	4	1	2	2	3	1	26-08-2016	8	2	2	8	2	1	1	2	3	7	1,5,8,14,15	1	0	1,2	2	2	0
140	140	27-08-2016	4	1	1	3	5	1	27-08-2016	8	2	1	2	2	1	1	3	3	1,3,4,7	1,8	1	0	1,2	2	1	0
141	141	29-08-2016	4	1	1	4	4	2	29-08-2016	8	2	3	2	2	1	1	2	3	1,3,4,6,7	2,4,5,8,9,14,16	1	1	1,2	3	1	0
142	142	31-08-2016	7	1	1	5	5	1	31-08-2016	8	2	1	12	2	1	1	1	3	1,3,4	1,8	1	0	1,2	2	1	0
143	143	02-09-2016	5	1	2	5	4	1	02-09-2016	9	2	2	2	2	1	1	3	3	1,7	2,3,4,5,7,14,16	1	0	3,4	4	1	0
144	144	02-09-2016	4	1	2	4	5	1	02-09-2016	9	2	1	2	2	1	1	2	3	1,7,8	2,3,4,7,16	1	2	3,4	2	2	0
145	145	05-09-2016	4	1	1	5	5	2	05-09-2016	9	2	3	9	1	1	2	3	3	3,4,5,7	1,2,5,8,9,14,15	1	0	1,2	2	1	0
146	146	06-11-2016	8	1	1	6	4	1	06-11-2016	11	3	1	13	2	1	2	1	3	1,3,4	1,5,8,9,14,15	1	0	2	3	1	0
147	147	08-10-2016	8	1	1	7	5	2	08-10-2016	10	3	2	2	1	1	1	2	3	7	5	2	0	3,4	4	2	0
148	148	10-10-2016	7	2	1	6	5	2	10-10-2016	10	3	1	3	2	1	1	2	3	1,2,4,7	2,3,4,5,14,16	1	0	1,2	2	1	0
149	149	12-10-2016	6	1	1	5	4	1	12-10-2016	10	3	1	2	2	1	1	3	3	1,3,7	4,5,8,9,11,12,14,15	1	0	2	3	1	0
150	150	15-10-2016	5	1	1	4	5	1	15-10-2016	10	3	2	2	2	1	1	2	3	1,2,3,6,7	2,5,8,9,16	1	1	1,2	2	1	0
151	151	17-11-2016	6	2	1	6	5	1	17-11-2016	11	3	2	2	5	1	1	2	3	1,3	3,5,8,6,9	1	0	1,2	2	1	0

152	152	19-11-2016	5	1	1	5	4	2	19-11-2016	11	3	1	1	2	1	2	2	3	1,3,7	1,2,8,15	1	0	1,2	3	1	0
153	153	21-11-2016	4	2	1	8	6	1	21-11-2016	11	3	4	10	2	1	1	1	3	2,3,6,7	2,3,4,5,8,9,14,16	1	1	3,4	4	1	0
154	154	23-11-2016	4	2	1	4	4	1	23-11-2016	11	3	1	4	2	1	2	1	1	6	8	1	1	3	1	3	1
155	155	26-11-2016	6	1	1	5	4	1	26-11-2016	11	3	2	7	4	1	2	1	1	1,4,6	1,5,8,9,10,15	1	1	3,4	3	1	1
156	156	28-11-2016	5	1	1	2	2	2	28-11-2016	11	3	2	11	2	1	1	2	3	7	1,8	1	0	1,2	2	2	0
157	157	01-12-2016	3	1	1	2	4	1	01-12-2016	12	4	2	5	2	1	1	1	3	2,3,6,7	2,3,4,5,8,9,14,16	1	1	3,4	4	1	0
158	158	03-12-2016	4	1	1	4	5	2	03-12-2016	12	4	1	2	2	1	2	3	3	1,3,6	1,2,5,8,9,14,15,16	1	1	1,2	2	1	0
159	159	05-12-2016	3	1	1	4	4	2	05-12-2016	12	4	2	4	1	1	1	2	3	1,3	2,5,8,9,11,14,15,16	1	0	1,2	2	1	0
160	160	07-12-2016	4	1	1	4	5	2	07-12-2016	12	4	1	2	2	1	2	3	3	1,3,7	1,2,5,8,9,14,15,16	1	0	1,2	3	1	0

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